Online ISSN : 2249 - 4618
Print ISSN : 0975 - 5888

Global Journal of Medical Research

DISCOVERING THOUGHTS AND INVENTING FUTURE

Highlights

- Alloxan Diabetic Rats
- Cardiovascular Response comparison
- Functional Regulators in Vibrio
- Drug Addiction and Rehabilitation

The Blood Plasma

Volume 12 | Issue 5 | Version 1.0

ENG

Global Journal of Medical Research

Global Journal of Medical Research
Volume 12 Issue 5 (Ver. 1.0)

Incorporation No.: 0423089
License No.: 42125/022010/1186
Registration No.: 430374
Import-Export Code: 1109007027
Employer Identification Number (EIN):
USA Tax ID: 98-0673427

Global Journals Inc.

*(A Delaware USA Incorporation with "Good Standing"; **Reg. Number: 0423089**)*

Sponsors: Open Association of Research Society
Open Scientific Standards

Publisher's Headquarters office

Global Journals Inc., Headquarters Corporate Office, Cambridge Office Center, II Canal Park, Floor No. 5th, ***Cambridge (Massachusetts)***, Pin: MA 02141 United States
USA Toll Free: +001-888-839-7392
USA Toll Free Fax: +001-888-839-7392

Offset Typesetting

Open Association of Research Society, Marsh Road, Rainham, Essex, London RM13 8EU
United Kingdom.

Packaging & Continental Dispatching

Global Journals, India

Find a correspondence nodal officer near you

To find nodal officer of your country, please email us at *local@globaljournals.org*

eContacts

Press Inquiries: *press@globaljournals.org*
Investor Inquiries: *investers@globaljournals.org*
Technical Support: *technology@globaljournals.org*
Media & Releases: *media@globaljournals.org*

Pricing (Including by Air Parcel Charges):

For Authors:
22 USD (B/W) & 50 USD (Color)
Yearly Subscription (Personal & Institutional):
200 USD (B/W) & 250 USD (Color)

Editorial Board Members (HON.)

Dr. Bart Lambrecht
Director of Research in Accounting and FinanceProfessor of Finance
Lancaster University Management School
BA (Antwerp); MPhil, MA, PhD (Cambridge)

Dr. Carlos García Pont
Associate Professor of Marketing
IESE Business School, University of Navarra
Doctor of Philosophy (Management), Massachusetts Institute of Technology (MIT)
Master in Business Administration, IESE, University of Navarra
Degree in Industrial Engineering, Universitat Politècnica de Catalunya

Dr. Fotini Labropulu
Mathematics - Luther College
University of ReginaPh.D., M.Sc. in Mathematics
B.A. (Honors) in Mathematics
University of Windso

Dr. Lynn Lim
Reader in Business and Marketing
Roehampton University, London
BCom, PGDip, MBA (Distinction), PhD, FHEA

Dr. Mihaly Mezei
ASSOCIATE PROFESSOR
Department of Structural and Chemical Biology, Mount Sinai School of Medical Center
Ph.D., Etvs Lornd University
Postdoctoral Training,
New York University

Dr. Söhnke M. Bartram
Department of Accounting and FinanceLancaster University Management SchoolPh.D. (WHU Koblenz)
MBA/BBA (University of Saarbrücken)

Dr. Miguel Angel Ariño
Professor of Decision Sciences
IESE Business School
Barcelona, Spain (Universidad de Navarra)
CEIBS (China Europe International Business School).
Beijing, Shanghai and Shenzhen
Ph.D. in Mathematics
University of Barcelona
BA in Mathematics (Licenciatura)
University of Barcelona

Philip G. Moscoso
Technology and Operations Management
IESE Business School, University of Navarra
Ph.D in Industrial Engineering and Management, ETH Zurich
M.Sc. in Chemical Engineering, ETH Zurich

Dr. Sanjay Dixit, M.D.
Director, EP Laboratories, Philadelphia VA Medical Center
Cardiovascular Medicine - Cardiac Arrhythmia
Univ of Penn School of Medicine

Dr. Han-Xiang Deng
MD., Ph.D
Associate Professor and Research Department Division of Neuromuscular Medicine
Davee Department of Neurology and Clinical NeuroscienceNorthwestern University Feinberg School of Medicine

Contents of the Volume

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Hypolipidemic Effects of Diaceto-Dipropyl-Disulphide on Alloxan Diabetic Rats

By Veena G. Raiker, Vickram, Vijay V & Kashinath R.T
Basaveshwara Medical College & Hospital Chitradurga. Karnataka, India

Abstract – Dyslipidemia is one of the major derrangement observed in type 2 diabetes mellitus which further leads to various life threatening complications. Certain herbal disulphides/thiols are known to cater a solution towards regulation of this diabetes mellitus induced dyslipidemia. It is known that Diallyl Disulphide (DADS), a component of garlic extract possess hypolipidemic activities and may have therapeutic applications, but the metabolite of DADS, acrolein is toxic and poses certain disadvantages. Certain modified /altered disulphides, shown to possess significant hypolipidemic action with lesser toxic effects. In the present study, we tried to establish the hypolipidemic activities of Diaceto-Dipropyl-Disulphide (DADPDS), a synthetic modified disulphide in alloxan diabetic rats. The results show a significant decrease in plasma cholesterol (60%), plasma triacylglycerol (42%), liver tissue cholesterol (41%) and liver tissue triacylglycerol (23%),indicating the usefulness of this modified disulphide in controlling diabetes induced dyslipidemia.

Keywords : *Diaceto Dipropyl Disulphide, hypolipidemic, alloxan diabetes.*

GJMR-B Classification : *NLMC Code: WD 200.5.H8, WF 141, WK 835*

Strictly as per the compliance and regulations of:

Hypolipidemic Effects of Diaceto-Dipropyl-Disulphide on Alloxan Diabetic Rats

Veena G. Raiker [α], Vickram [σ], Vijay V [ρ] & Kashinath R.T [ω]

Abstract - Dyslipidemia is one of the major derrangement observed in type 2 diabetes mellitus which further leads to various life threatening complications. Certain herbal disulphides/thiols are known to cater a solution towards regulation of this diabetes mellitus induced dyslipidemia. It is known that Diallyl Disulphide (DADS), a component of garlic extract possess hypolipidemic activities and may have therapeutic applications, but the metabolite of DADS, acrolein is toxic and poses certain disadvantages. Certain modified /altered disulphides, shown to possess significant hypolipidemic action with lesser toxic effects. In the present study, we tried to establish the hypolipidemic activities of Diaceto-Dipropyl-Disulphide (DADPDS), a synthetic modified disulphide in alloxan diabetic rats. The results show a significant decrease in plasma cholesterol (60%), plasma triacylglycerol (42%), liver tissue cholesterol (41%) and liver tissue triacylglycerol (23%),indicating the usefulness of this modified disulphide in controlling diabetes induced dyslipidemia.

Keywords : Diaceto Dipropyl Disulphide, hypolipidemic, alloxan diabetes.

I. Introduction

Diabetes mellitus is a systemic metabolic disease characterized by hyperglycemia, hyperlipidemia, hyperaminoacidemia and hypoinsulinemia that results from decrease in both insulin secretion and insulin action (1). Dyslipidemia, a complication associated with diabetes mellitus leads to profound alteration in the concentration and composition of lipid profile in the body which lead to the increase in the lipid concentration in the liver cells (2-4). It is evident that during diabetes the level of total lipids, triacylglycerol and total cholesterol increases both in plasma and tissue significantly (2). There are many herbal products which are proved to have the beneficial effect in significantly lowering the lipid levels during diabetes. Garlic's sulphur compounds specifically, DADS (Diallyl Disulphide) is known to inhibit the lipogenic enzymes and reduces cholesterol and triacylglycerol synthesis (5-8). Apart from these known beneficial effects of garlic and its products, there are reports that misuse or overuse of these may produce (9). Acrolein, the possible metabolite of DADS is thought to be responsible for its toxic effects (10,11). It was thought that unsaturation of DADS may be responsible for its toxic effects by giving rise to toxic product, acrolein and the hypolipidemic activity lies in its disulphide nature. Few attempts were made in the past to prepare and use certain synthetic disulphides which mimic the beneficial effects of DADS but devoid of any toxic effects (12). In the present study an attempt was made to assess the hypolipidemic effect of Diaceto-dipropyl-disulphide (DADPDS), a synthetic, modified disulphide in alloxan diabetic rats.

II. Materials and Methods

All chemicals employed in the present study were of Analar grade (A.R). Alloxan was procured from Loba chemie and thiopropanol (3-mercapto-1-propanol) from Sigma- Aldrich Company USA. This thiopropanol was used for the preparation of Diaceto-dipropyl-disulphide (DADPDS).

III. Synthesis of Dadpds

5 grams of thiopropanol was treated with 1N iodine in potassium iodide solution drop by drop till a light yellow colour persists and the contents were dissolved in 100 ml diethyl ether. To this 10 ml ice cold acetyl chloride was added and mixed. The above mixture was kept at 10-15˚ C for 3 hours. The separated ether layer was washed twice with 25 ml portions of ice cold saturated sodium chloride solution. Later washed 4 times with 0.1N sodium hydroxide solution in saturated sodium chloride then washed once with 10 ml 0.1N sodium thiosulphate in saturated sodium chloride and finally washed once with 10 ml glass distilled water. Later the ether layer was clarified with anhydrous sodium sulphate and dried at 50-55˚C for 30 minutes. The residue was Diaceto-Dipropyl-Disulphide. This was employed to feed rats in the present study.

IV. Animals

Adult male albino rats weighing 150-200g randomly selected from Central animal house of the Basaveshwara Medical College, Chitradurga were employed for the present study. A commercial standard pellet diet (Amruth Rat Feed supplied by Pranav Agro

Author α: Research student, Department of Biochemistry. Basaveshwara Medical College & Hospital Chitradurga. Karnataka, India.
Author σ : Tutor, Department of Biochemistry Basaveshwara Medical College & Hospital Chitradurga. India.
Author ρ: Assistant professor, Department of Biochemistry, Vijayanagara Institute of Medical Sciences, Bellary, India.
Author ω : Professor , Department of BiochemistrySBIMS, Subbaiah Hospital, Shimoga,India.

industries, Pune, India) and water was made available to animals *ad libitum*. Animals were maintained in a controlled environment (25±5 C˚) with light-dark cycles in an experimental room simulating natural conditions. All the animals are cared according to the rules and regulations of the CPCS (Committee for the purpose of Control and Experiments on Animals), New Delhi and IAEC (Institutional Animal Ethical Committee) of Basaveshwara Medical College, Chitradurga.

V. Induction of Diabetes Mellitus

The animals were fasted overnight and diabetes was induced by a single intraperitoneal injection of freshly prepared alloxan monohydrate (150 mg/kg body weight) (13,14) in sterile normal saline . The diabetes was confirmed by examining urine sample for sugar by using standard urine glucose strips (Qualigens). The rats whose urine showed a positive test for glucose for 3 consecutive days were labelled as diabetic. The treatment with DADPDS was started on 5th day after alloxan injection and was considered as first day of treatment.

VI. Grouping

The rats were divided into 3 groups comprising 6 rats in each group as follows.

a) Group 1

Served as normal rats maintained on normal lab diet and water *ad libitum* and were received 30ml of normal saline per kg body weight daily for 30 days.

b) Group 2

Served as diabetic control rats maintained on normal lab diet and water *ad libitum* and were received 30ml/kg body weight normal saline daily for 30 days.

c) Group 3

Served as DADPDS treated diabetic rats. The group consists of alloxan diabetic rats, maintained on normal lab diet and water *ad libitum,* and was received 100mg/kg body weight of DADPDS as 30ml suspension daily for 30days.

After the stipulated period, the rats of group 1, 2 and 3 were sacrificed by anaesthetizing. Blood samples were collected using heparin as an anticoagulant. Liver tissue was procured, blotted smoothly to remove blood stains and kept individually in clean dry glass beaker with aluminium foil cover at 0-4º C for further usage. Blood samples were centrifuged at 3000 rpm for 5 mins, the separated plasma was employed for estimation of lipid parameters - total cholesterol (15) and triacylglycerol (16). A part of the liver tissue was homogenized with 9 parts of chloroform-methanol mixture (1:1, v/v) for 5 mins using Potter Elvejham tissue homogenizer and the mixture was centrifuged at 3000 rpm for 5 minutes. The supernatant was employed for the estimation of lipid parameters - total cholesterol (15) and triacylglycerol (16).

Another part of liver was homogenised with 9 parts of 5% cold TCA for 5 mins, and extract was employed for estimation of thiobarbituric acid reactive substances (TBARS) (17). A third part of liver tissue was homogenized with 9 parts of cold phosphate buffer (pH -7.4) for 5 mins and centrifuged at 3000 rpm for 5 minutes and the supernatant was used for the estimation of total thiol groups (18).

VII. Statistical Evaluation

Results obtained in the present study are expressed as their Mean ± SD. The data entry was carried out using Microsoft Office Excel and statistically analysed and probability (p value) was calculated by students't' test.

VIII. Results

The results of the present study are narrated in table -1 and in graphs 1-6. Table-1 shows the levels of plasma cholesterol,liver tissue cholesterol, plasma triacylglycerol, liver tissue triacylglycerol, liver TBARS and liver total thiol groups in normal group(group 1), alloxan diabetic group(group 2)and in DADPDS treated alloxan diabetic group(group 3).

It is seen from the table and from the graphs given that there is a significant raise in plasma cholesterol ($p<0.001$), plasma triacylglycerol ($p<0.001$), liver tissue cholesterol($p<0.001$), liver tissue triacylglycerol ($p<0.001$), and liver TBARS levels($p<0.001$) in group 2 as compared to group 1 whereas levels of liver tissue total thiol group were significantly lowered($p<0.05$) in group 2 as compared to group 1. Further it is evident from the table and graphs that there is a significant decrease in plasma cholesterol ($p<0.001$), plasma triacylglycerol ($p<0.001$) , liver tissue cholesterol ($p<0.001$), liver tissue triacylglycerol ($p<0.001$) and in liver tissue TBARS levels ($p<0.001$) in group 3 as compared to group 2 , whereas , a moderate raise in liver tissue total thiol groups observed in group -3 rats compared to group-2 rats (refer table -1, graphs 1-6).

IX. Discussion

Dyslipidemia which is a common abnormality associated with diabetes mellitus may be resulting from insulin deficiency (19) , a similar picture may be seen in alloxan diabetic rats as it is known that alloxan induce profound β-cell damage of islets of Langerhans leading to insulin deficiency(20,21). Earlier it is shown by C .S. Yadav (2)that in alloxan diabetic rat , the lipid levels both in liver and plasma rise by about 48 -55% . The results depicted in table- 1 agrees with this and there is an increase of 58% and 18% respectively in plasma total cholesterol and triacylglycerols and also an increase of 21% and 36% in liver total cholesterol and liver triacylglycerols respectively.

Many herbal extracts have been employed as lipid lowering substances since long time. Garlic (Allium sativum) and its extracts are the best known for their hypolipidemic actions (5). The hypolipidemic effects of garlic has been attributed to its principle organosulphur compound, Diallyl disulphide (DADS) which is known to inhibit HMG CoA reductase and possibly reduce plasma/tissue cholesterol levels (22-23). But the over use of garlic may induce many toxic effects (10) due to acrolein a possible metabolite of DADS.

In order to overcome this harmful effect of DADS certain synthetic disulphides with lesser to moderate hypolipidemic benefits been employed by earlier workers (24). DADPDS, a low molecular weight acetylated disulphide been employed for its hypolipidemic actions in alloxan diabetic rats in the present study. A 100 mg/kg body weight dosage of this disulphide shows a significant hypolipidemic effect ($p<0.001$) and hypocholesterolemic ($p<0.001$) effect (refer table -1 and graphs 1-6). DADPDS is a disulphide, similar to any other disulphide, undergoes reduction to its component thiols by utilizing NADPH (25) as shown below:

$$\text{R-S-S-R} + 2\text{NADPH} \longrightarrow 2\text{R-SH} + 2\text{NADP}$$

Hence decreases cellular NADPH levels thereby causing a decrease in lipid and cholesterol synthesis as it is known that HMG CoA reductase, the key enzyme of cholesterol biosynthesis as well as glycerol -Ⓟ-dehydrogenase requires NADPH , thus a reduction in the cellular NADPH could decrease cholesterol as well as triacylglycerol synthesis. Further it is known that DADS is an inhibitor of HMG CoA reductase and decreases the activity of this enzyme hence induces hypocholesterolemia (26). DADPDS, a synthetic disulphide employed in the present study which is similar to DADS, a small molecular weight disulphide may induces hypocholesterolemia in alloxan diabetic rats probably by inhibiting HMG CoA reductase (refer table).Thus causing a decrease in plasma as well as liver tissue cholesterol(refer table-1, graph 1 & 3).

It is also known that many lipogenic enzymes are thiol enzymes (25)and the results of present study given in table 1 shows that in group 3 the total liver tissue thiol groups has significantly raised ($p<0.05$) as compared to group 2. Suggesting that DADPDS improve the cellular thiol group status probably by reducing the free radical levels by acting as a free-radical scavenging agent (refer table 1 , graph 5 & 6).

Thus it may be concluded that DADPDS at the dosage employed in the present study has a definite hypolipidemic and hypocholesterolemic action in alloxan diabetes rats.

Table 1: Showing the levels of total cholesterol, triacylglycerol in plasma and liver tissue, as well as TBARS and –SH group content in liver tissue of normal group, Alloxan diabetic group and DADPDS treated alloxan diabetic group

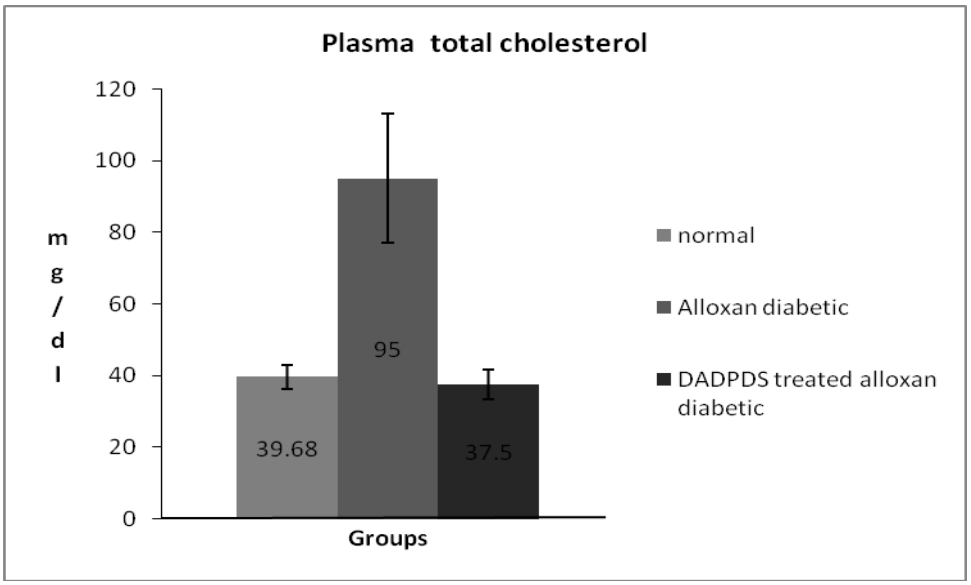
Groups	TOTAL CHOLESTEROL		TRIACYLGLYCEROL		Liver TBARS μmol/MDA/g	Liver total -SH GROUP mg/g T
	Plasma mg/dl	Tissue mg/g T	Plasma mg/dl	Tissue mg/g T		
NORMAL RATS GROUP 1 (n=6)	39.68 ± 3.40	4.50 ± 0.39	128.2 ± 2.83	16.64 ± 2.15	4.26 ± 1.26	0.94 ± 0.11
ALLOXAN DIABETIC RATS GROUP 2 (n=6)	95.0*** ± 18.10	5.7*** ± 0.48	176.4*** ± 2.0	26.8*** ± 1.6	13.84*** ± 1.40	0.81* ± 0.06
DADPDS TREATED ALLOXAN DIABETIC RATS GROUP 3 (n=6)	37.5*** ± 4.18	3.37*** ± 0.58	102.2*** ± 2.0	20.48*** ± 1.9	4.33*** ± 1.22	0.94* ± 0.10

Note :

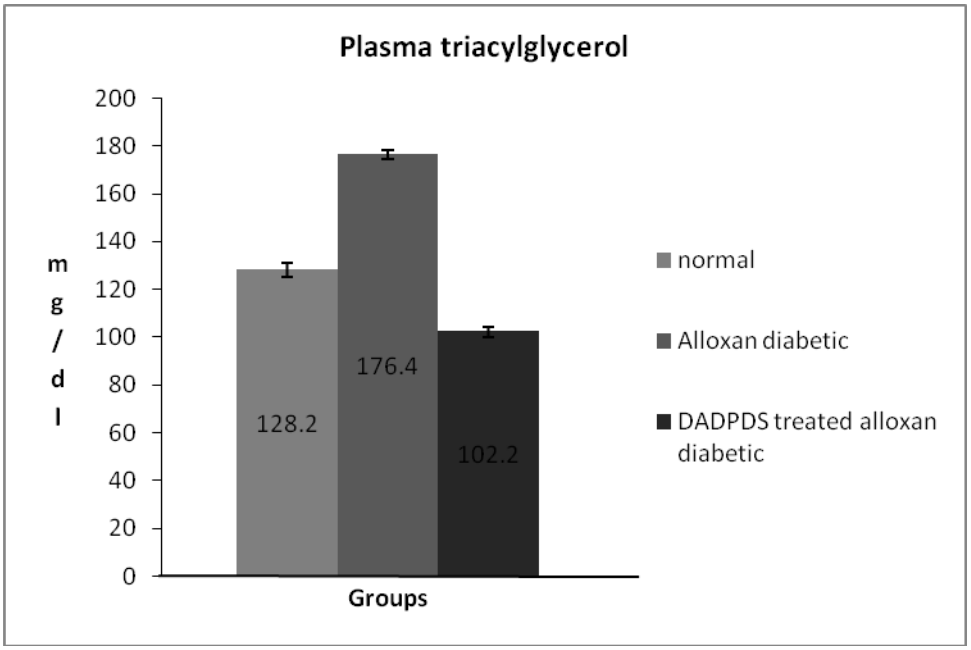
1. The values are expressed as Mean ± SD.
2. Number in parentheses indicates the number of animals in that group.
3. Statistical evaluation – probability level *p<0.05, **p<0.01, ***p<0.001

X. Graphs

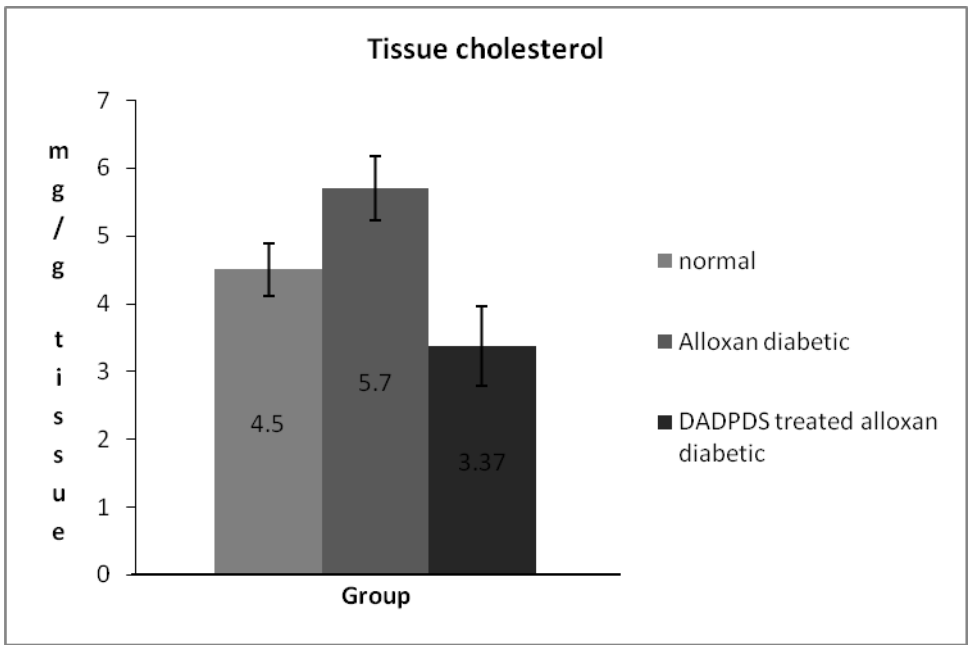
Graph -1-1showing plasma total cholesterol level in normal, alloxan diabetic and DADPDS treated alloxan diabetic rats



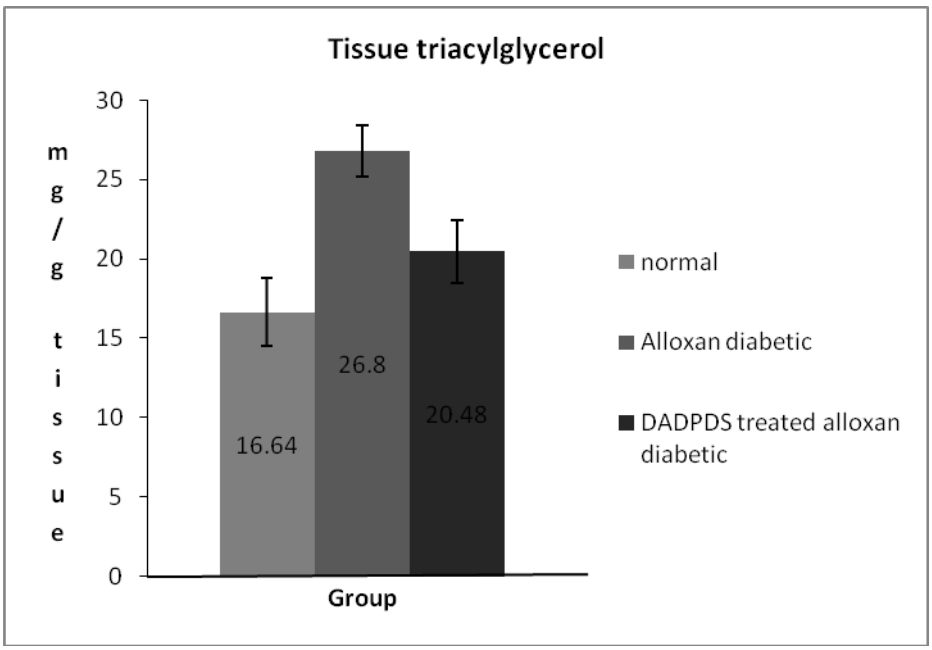
Graph - 2 showing plasma triacylglycerol levels in normal, alloxan diabetic and DADPDS treated alloxan diabetic rats



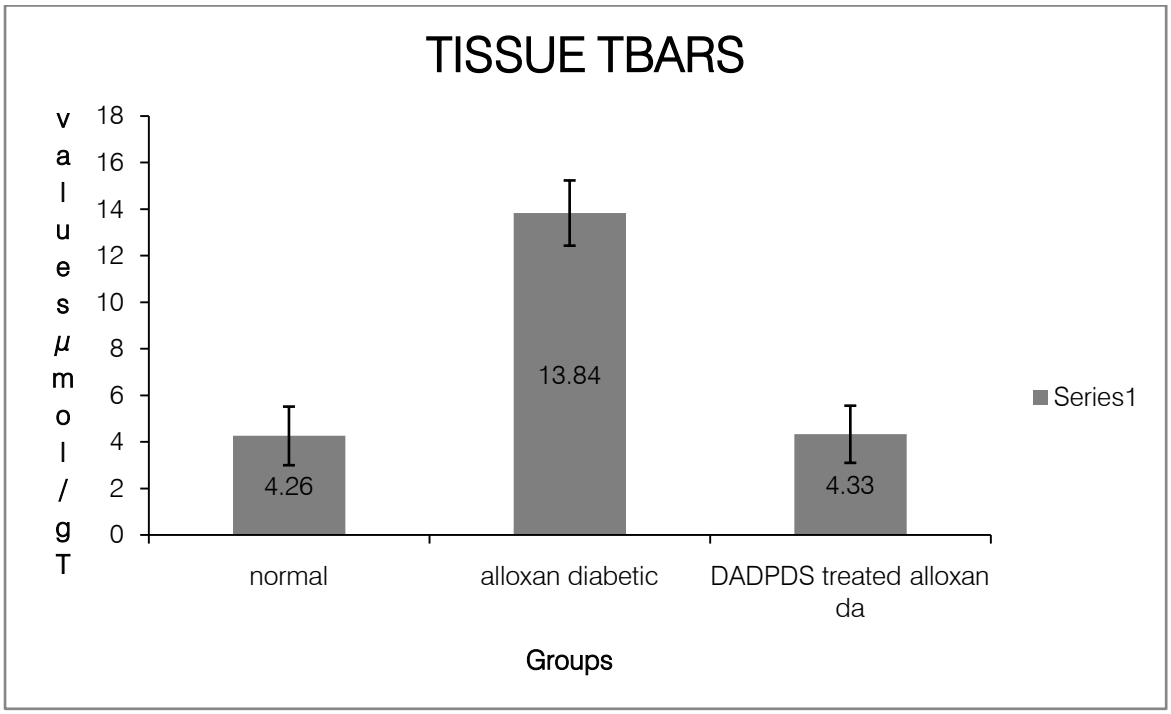
Graph -3 showing liver tissue total cholesterol level in normal, alloxan diabetic and DADPDS treated alloxan diabetic rats



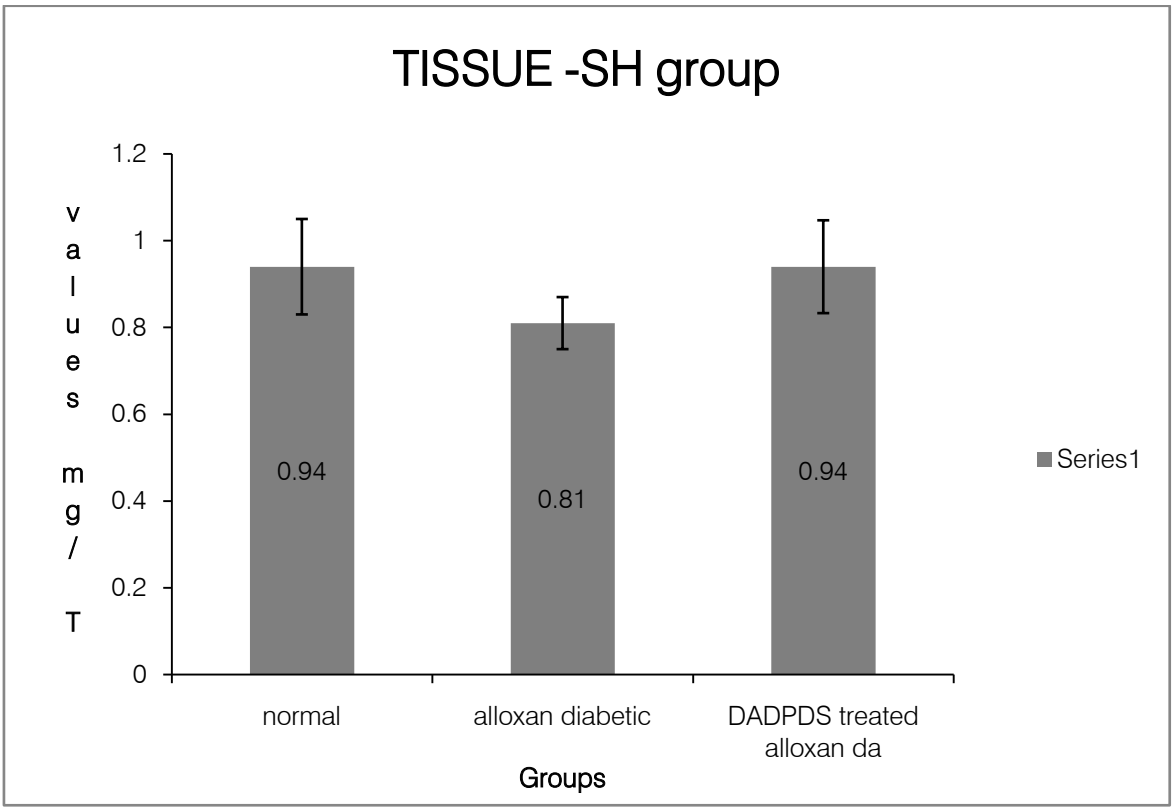
Graph -4 showing liver tissue triacylglycerol levels in normal; alloxan diabetic and DADPDS treated alloxan diabetic rats



Graph - 5 showing liver tissue TBARS content in normal, alloxan diabetic and DADPDS treated alloxan diabetic rats



Graph -6 showing liver tissue total – SH group content in normal, alloxan diabetic and DADPDS treated alloxan diabetic rats



References Références Referencias

1. Altan, V.M., The pharmacology of diabetic complications. Current Medicinal Chemistry 10, (2003) 1317–1327.
2. Umesh C S Yadav, K. Moorthy and Najma Z Baquer " Effects Of Sodium- orthovanadate and *Trigonella foenum-graecum* seeds on hepatic and renal lipogenic enzymes and lipid profile during alloxan diabetes" in J. Bio sci, Vol 29, 1, March 2004.
   Arky R A 1982 Clinical correlates of metabolic derrangements of diabetes mellitus; in *Complications of diabetes mellitus* (ed.) G P Kozak (Philadelphia: W B Saunders) pp 16–20.
4. Sochor S, Baquer N Z, Ball M R and McLean P 1987 Regulation of enzymes of glucose metabolism and lipogenesis in diabetic rat liver by thyroid hormones; *Biochem. Int.* 15: 619–627.
5. Yu-YanYeh and Lijuan Liu, "Cholesterol Lowering Effect of Garlic Extracts and Organosulfur copounds: Human and Animal studies: Journal of nutrition, 2001, 989s-993s.
6. Qureshi A. A et al (1983a) Inhibition of cholesterol and fatty acid biosynthesis in liver enzymes and chicken hepatocytes by polar fractions of garlic. Lipids; 18:343-348.
7. Qureshi A. A., et al (1983b) Suppression of avian hepatic lipid metabolism by solvent extracts of garlic: impact on serum lipids. J. Nutr.; 113:1746-1755.
8. Qureshi A. A et al (1987) Influence of minor plant constituents on porcine hepatic lipid metabolism: impact on serum lipid. Atherosclerosis; 64 :109 - 115.
9. Osama Imada.(1990). Abst. I world Congress on health significance of garlic & garlic constituents, Washington.
10. Kashinath R.T., Joseph P.K.: A Study On Garlic Toxicity. Journal of Advance Researches in Biological Sciences.Dec.2009.Vol.1 No.2.pg.39-45
11. Reynolds, E.F.(1993). In Martindale The Extra Pharmacopeia. Acrolein. 12322a, 13th Edition, The Pharmaceutical Press, London. Pp 1331.
12. Fenwick G. R and Hanley A. B: CRC Critical Reviews in Food Science and Nutrition. 23, 1-12, 1985.
13. Szkudelski .T: The Mechanism of Alloxan and Streptozotocin Action in B cells of the Rat pancreas: physiol .Res .50: 536-546, 2001.
14. Ashok D.Chougale, et al : Optimization of Alloxan Dose is Essential to Induce Stable Diabetes for prolonged period : Asian Journal of Biochem 296), 402-408, 2007.

15. Varley H, Gowenloch. A.H & Bell M. "Determination of Blood Cholesterol." Practical Clinical Biochemistry. 5th edn, London Heimann-professional publishing Ltd, vol 1, 1991: pp 467-477
16. Richard J. Henry, Donald C. Connan and James, W. Winkalman (1974) chap 25 carbohydrates pp 1285-1289 in "Clinical Chemistry – Principles and Practice", 2nd Edn, 1974, Harper Row Publishers, New York.
17. Nadiger,H .A, Marcus, S R, Chandrakala, M. V and Kulkarni, D.D. "Malonyldialdehyde levels in different organs of rat subjected to acute alcohol toxicity". Ind J clin.Biochem.1986, 1:133-136.
18. Colowick and Kaplan, Enzymes in Lipid Metabolism in "Methods in Enzymology". 1957: Vol-1, 623-624. In
19. "Joslin's Diabetes Mellitus", 14th Edn B. I Publications, 2005.
20. Nidhi Sharma, veena Garg and Arpita Paul in " Antihyperglycemic, Antihyperlipidemic and Antioxidative potential of prosopis cineraria Bark" .Ind Jclin .Biochem, 2010/25(2) 193-200.
21. Henry J. Clinical diagnosis and management by laboratory methods. 17 ed, saunders WB, 1984:1433 pp.
22. Gilbert H F and Stewart M L: J. Biol Chem: 256, 1782- 1785, 1981.
23. Yu-Yan Yeh and Shaw-Mei Yeh, in "Garlic Reduces Plasma Lipids by Inhibiting Hepatic Cholesterol and Triacylglycerol synthesis .Lipids, vol 29. No.3 (1994) pp 189- 193.
24. Kashinath R. T-" Hypolipidemic effects of disulphides in rats fed high lipid diet and or ethanol", Ph.D thesis, Bangalore university, 1993.
25. Ziegler .D .M. "Role of reversible oxidation – reduction of enzyme thiols-disulfides in metabolic regulation ", Ann. Rev .Biochem, 1985, 54:314.
26. Gebhardlt, R & Beck .H. (1996). Differential inhibitory effects of garlic – derived organosulfur compounds on cholesterol biosynthesis in primary rat hepatocytes cultures. Lipids 31: 1269- 1276.

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Identification of the Role of LuxS in the Regulation of Motility & the Expression of the Flagellar Structural & Functional Regulators in *Vibrio Cholerae*

By Smritikana Biswas, Prithwiraj Mukherjee, Shyamalendu Kar & Chandradipa Ghosh

Vidyasagar University, Medinipur-West, West Bengal, India.

Abstract – In *Vibrio cholerae* motility has an important role in virulence. Beside this *flrA, flrB* and *flrC* regulate the expression of both flagellar structure and function in *Vibrio cholerae*. Quorum sensing autoinducer molecules regulate the expression of EPS in *Vibrio cholerae* O139 Bengal strain MO10. The present study was conducted to investigate whether *luxS* gene (responsible for the synthesis of quorum sensing autoinducer molecule 2 i.e, AI-2) regulates motility as well as expression of both structural and functional regulatory genes *flrA, flrB* and *flrC.* In the peresent study we found that mutation in *luxS* gene caused reduction in motility and expression of flra was significantly decreased in the *luxS* mutant strain of the *Vibrio cholerae* O139 Bengal strain MO10 lac –. However expression of *flrB* and *flrC* remained unaltered by luxs gene. So *luxS* gene may regulate motility through the upregulation of flrA in *Vibrio cholerae* O139 Bengal strain MO10.

Keywords : *Vibrio cholerae O139 Bengal strain MO10 lac-, Δ luxS, Δ flaAluxS, motility, Δ -galactosidase assay.*

GJMR-K Classification : *NLMC Code: WC 262, WW 410, QW 51, QU 21*

Strictly as per the compliance and regulations of:

Identification of the Role of LuxS in the Regulation of Motility & the Expression of the Flagellar Structural & Functional Regulators in *Vibrio Cholerae*

Smritikana Biswas [α], Prithwiraj Mukherjee[σ], Shyamalendu Kar[ρ] & Chandradipa Ghosh [ω]

Abstract - In *Vibrio cholerae* motility has an important role in virulence. Beside this *flrA*, *flrB* and *flrC* regulate the expression of both flagellar structure and function in *Vibrio cholerae*. Quorum sensing autoinducer molecules regulate the expression of EPS in *Vibrio cholerae* O139 Bengal strain MO10. The present study was conducted to investigate whether *luxS* gene (responsible for the synthesis of quorum sensing autoinducer molecule 2 i.e, AI-2) regulates motility as well as expression of both structural and functional regulatory genes *flrA, flrB* and *flrC*. In the peresent study we found that mutation in *luxS* gene caused reduction in motility and expression of flra was significantly decreased in the *luxS* mutant strain of the *Vibrio cholerae* O139 Bengal strain MO10 lac $^{-}$. However expression of *flrB* and *flrC* remained unaltered by luxs gene. So *luxS* gene may regulate motility through the upregulation of *flrA* in *Vibrio cholerae* O139 Bengal strain MO10.

Keywords : Vibrio cholerae O139 Bengal strain MO10 lac-, Δ luxS, Δ flaAluxS, motility, Δ -galactosidase assay.

I. Introduction

Vibrio cholerae is a natural inhabitant of the aquatic environment and this organism is introduced into human populations through the ingestion of contaminated food or water. In human after colonization to the small intestine through the action of a type IV pilus (TCP) it expresses cholera toxin (CT), which causes the electrolyte imbalance and profuse watery diarrhea. In natural aquatic environment Vibrio cholerae forms biofilm for its long survival in the environment and motility plays an important role in biofilm formation by inducing initial attachment to abiotic surface (Mois et al., 2009). in the planctonic state, flagella and fimbriae are crucial for motility and initial adherence to a solid surface (Watnic and Kolter 1999).

Vibrio cholerae is a highly motile organism due to presence of a polar flagellum. Motility and virulence have been inferred to be inversely related to each other (Lospalluto and Finkelstein, 1972; Mekalanos et al., 1983; Taylor et al., 1987; Richardson, 1991). But the exact role of motility in pathogenesis is still remained unclear (Prouty et al., 2001).

The flagellum is a complex structure comprising of multiple structural subunits and expression of flagellar genes is also well regulated involving a four-tiered flagellar transcription hierarchy. Three regulatory genes, *flrABC* (express flagellar regulatory proteins ABC) are additionally required for the flagellar synthesis. FlrA encoded by class I gene is the master regulator of the flagellar transcriptional hierarchy and σ^{54}-dependent transcriptional activator of class II genes, which encode mainly the MS ring and export apparatus components and regulatory factors, including FlrC (Millikan et al., 2003). FlrC is aσ^{54}-dependent transcriptional activator that is phosphorylated by FlrB (sensor kinase) component and activates class III flagellar genes which encode the basal body and hook, as well as some of the switch and export apparatus components and the FlaA flagellin. Suggestion is there that the *Vibrio cholerae* polar flagellar filament is composed of five flagellins, but only one of these, FlaA is essential for motility (Klose and Mekalanos, 1998a).

Repression of FlrA and FlrC increase expression of EPS in response to some environmental signals (Watnic et al., 2001). On the other hand in *Vibrio fishery* FlrA / FlrC are also found to be involved in the motility (Millikan et al., 2003). In the epidemic subset of *Vibrio cholerae* including some O1 El Tor and O139 strain absence of flagellar structure triggers the expression of exopolysaccharie which is required for the development of the mature biofilm (Yildiz et al., 1999; Watnic et al., 2001). Beside this *flaA* (responsible for the synthesis of flagellar structural core protein) mutant strain is nonmotile as well as defective in intestinal colonization (Watnick et al., 2001).

Authors α : Research scholar, Department of Human Physiology with Community Health, Vidyasagar University, Medinipur-West, West Bengal, India. E-mail:physio.smritikana@gmail.com

Authors σ : Prithwiraj Mukherjee, Department of Human Physiology with Community Health, Vidyasagar University, Medinipur-West, West Bengal, India. E-mail:muprithwiraj@gmail.com

Authors ρ : Shyamalendu Kar, Department of Human Physiology with Community Health, Vidyasagar University, Medinipur-West, West Bengal, India. E-mail: ShyamalenduKar.kar @gmail.com

Authors ω : Dr. Chandradipa Ghosh, Associate Professor, Department of Human Physiology with Community Health, Vidyasagar University, Medinipur-West, West Bengal, India. E-mail:ch_ghosh@mail.vidyasagar.ac.in

It was previously proposed that cross-species quorum-sensing signaling molecule AI-2 (*luxS* gene product) stimulates biofilm formation and alters its architecture by stimulating flagellar motion and motility in *Escherichia coli* (González-Barrios et al., 2006). Moreover *luxS* gene was also reported to be involved in controlling chemotaxis, flagellar synthesis and motility in *E. coli* and *Helicobactor pylori* (Ren et al., 2004; Sperandio et al., 2001; Osaki et al., 2006).

It is also observed that *luxS* gene (responsible for the synthesis of quorum sensing cell signaling molecule autoinducer 2 i.e AI-2) regulates EPS expression and biofilm formation in *Vibrio cholerae* O139 Bengal strain MO10 lac$^-$ through the Quorum sensing autoinducers and flagellum-dependent parallel but converging EPS signaling circuits independent of input of LuxO-HapR (Biswas et al., 2012, unpublished). However expression of *flaA* gene (responsible for the synthesis of flagellar structural core protein) was not under the control of *luxS* gene (Biswas et al., 2012, unpublished). So, on the basis of these reports the present study was carried out to investigate whether *luxS* gene (responsible for the synthesis of quorum sensing autoinducer molecule 2 i.e, AI-2) regulates motility as well as expressions of both structural and functional regulatory genes *flrA, flrB* and *flrC*.

II. Methods and Materials

a) Bacterial growth

MO10 *luxS*, *flaAluxS* mutant strain as well as *Vibrio cholerae* O139 Bengal strain MO10 lac$^-$, a clinical isolate and a strain with high epidemiological importance were used for the present investigation. *Vibrio cholerae* O139 Bengal strain MO10 lac$^-$, *luxS*, *flaAluxS* were grown in Luria-Bertani (LB) broth, supplemented with streptomycin (100 μg of per ml). All the strains used for this study were displayed in the Table 2.

b) Detection of Motility

Motility of the *Vibrio cholerae* strains were tested by the method mentioned by Rasid et al. (2003) using swarm plate containing 0.3 % LB agar.

c) Plasmid construction

The promoter-*lacZ* fusion containing transcriptional reporter plasmid of *flrA, flrB* & *flrC* were prepared by PCR amplification of the respective promoter using primer pairs Promoter A and B for corresponding gene (Table 1). PCR generated fragment was digested with EcoRI and BamHI and ligated into the corresponding sites of plasmid vector pRS551 (Simons et al., 1987). Then finally electroporated into *Vibrio cholerae* MO10 lac$^-$ wild type, ***ΔluxS*** and ***ΔflaAluxS*** strains. All plasmid constructs and strains used in this study were displayed in Table 2. All PCRs were performed using MO10 chromosomal DNA as template and specific primer pairs which were designed depending on the specific gene sequence from complete *Vibrio cholerae* genome sequence (Kwok et al., 1990; Heidelberg et al., 2000). Chromosomal DNA (template DNA) was isolated by the method of Sambrook et al., 2001.

d) β -Galactosidase assays

Vibrio cholerae MO10 lac$^-$ wild type, ***ΔluxS*** and ***ΔflaAluxS*** strains were transformed with plasmids pSH130, pSH131 and pSH132 respectively, the transcriptional reporter constructs (Table 2). Bacterial cells grown in LB broth were harvested at OD_{600} of ~ 0.2 to 0.4, permeabilized with chloroform and sodium dodecyl sulfate and assayed for β-galactosidase activity following the method mentioned by Miller et al., 1992.

Table 1: Oligonucleotide primer sequence

Target gene or encoding region	Primer sequence (5'-3')
FlrA Promoter-A	GC GAATTCGCTCTAGATAGTTTCGCTAA
FlrA Promoter-B	GCGGATCCGCTCTAGACAAGCGAACCAT
FlrB Promoter-A	GCGAATTCGCAGATCTTGGGTTGGCTTC
FlrB Promoter-B	GCGGATCCGCAGATCTCAGCCAGAGCCT
FlrC Promoter-A	GC GAATTC GCCACTCATAACCCGCTAAA
FlrC Promoter-B	GCGGATCC CCAGAGTCGTTGCAGCACAA

Table 2 : Plasmid and strains used in this study

Strains	Description	Source
Vibrio cholerae strains		
MO10 lac$^-$	WildType,O139 Bengal strain	Laboratory collection
CG104	MO10 lac$^-$ Δ*luxS*	This study
CG110	MO10 lac$^-$ *ΔflaAluxS*	This study
Plasmids		
pRS551	Transcriptional *lacZ* fusion vector; Amp^r	Laboratory collection
pSH130	*flrA-lacZ* in pRS551	This study
pSH131	*flrB-lacZ* in pRS551	This study
pSH132	*flrC-lacZ* in pRS551	This study

III. Result and Discussion

In *Vibrio cholerae* flagellar synthesis and motility are thought to be important for cholera pathogenesis, but the exact role they play in virulence is still not completely understood. (Lospalluto and Finkelstein, 1972; Mekalanos et al., 1983; Taylor et al., 1987; Richardson et al., 1991; Prouty et al., 2001).

In many bacterial species, flagellar gene transcription occurs in a regulatory hierarchy in which the expression of late genes (i.e., class III or IV) is dependent on the expression of early ones (i.e., class I or II). In *Vibrio cholerae*, the σ^{54}-dependent transcriptional activator FlrA is the sole class I gene which regulates the expression of FlrABC regulon (Prouty et al., 2001; Josenhans et al., 2002; Stewart et al., 1996). FlrA, FlrB and FlrC are reported to be additionally required for the expression of both flagellar structure and function in *Vibrio cholerae*. The flagellar motor regulates the exopolysaccharide expression. EPS expression was reported to be involved in biofilm formation and this in turn also affects the virulence of the organism because motility was required for its behavior of colonization (Klose & Mekalanos, 1998a). Report shows that repression of either FlrA- or FlrC-dependent transcription ceases flagellar synthesis and produces rugose colony in wild type *Vibrio cholerae* O139 (Watnic et al., 2001). Mutations in flagellar genes at any level results in the absence of a complete flagellar filament and also produce rugose colony morphology in the *Vibrio cholerae* O139 strain MO10 (Watnic et al., 2001).

Quorum sensing cell signaling molecule autoinducer 2 (*luxS* gene product) is also previously reported to control EPS expression, biofilm formation as well as motility in *Helicobactor pylori* as well as *E. Coli* (Ren et al., 2004; Osaki et al., 2006; Sperandio et al., 2001,

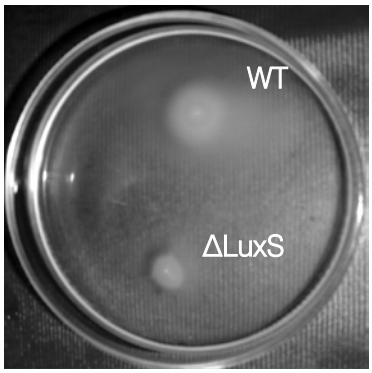


Fig.1 : Comparision of motility between Wild type & Δ*luxS* strain

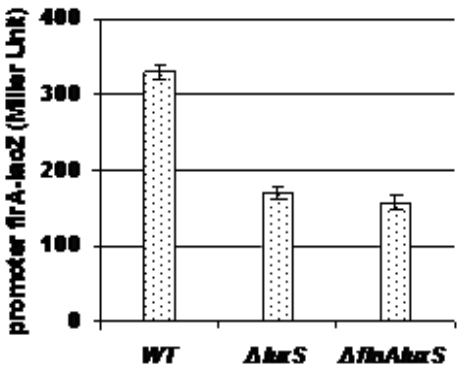


Fig. 2 : Comparison of *flrA* expression among *luxS* mutant strain of *Vibrio cholerae* MO10 lac$^-$ & wild type Transcription level of *flrA* was observed by Δ -galactosidase assay using *flrA promoter-lacZ* fusion transcriptional reporter construct

Additionally it was also proposed that *luxS* gene (responsible for the synthesis of quorum-sensing signal AI-2) is involved in the regulation of EPS expression as well as biofilm formation in *Vibrio cholerae* O139 Bengal strain MO10 lac $^-$ (Biswas et al., 2012 unpublished). So, on the basis of this background we were interested to investigate the role of *luxS* (responsible for the synthesis of quorum sensing autoinducer molecule 2 i.e, AI-2) in motility as well as in the expression of both flagellar structural and functional regulatory genes i.e *flrA, flrB* and *flrC*. In our study we found that motility was reduced in the *luxS* mutant strain of *Vibrio cholerae* O139 Bengal strain MO10 lac$^-$ than that of the wild type (fig-1). Beside this we also found that expression of *flrA* is significantly decreased after deletion in *luxS* gene in *Vibrio cholerae* MO10 lac $^-$ O139 Bengal strain (Fig 2). But expression of

flrB, flrC were not significantly altered in *luxS* mutant strains (Fig 3 &Fig 4). So, these observations suggested that *luxS* gene (responsible for the synthesis of quorum sensing autoinducer molecule 2 i.e, AI-2) upregulated the trancription of *flrA*, but transcription level of *flrB* and *flrC* were not influenced by *luxS* gene. Finally it can also be proposed that *luxS* gene may regulate the motility through the upregulation of expression of *flrA* in this epidemic subset of *Vibrio cholerae*.

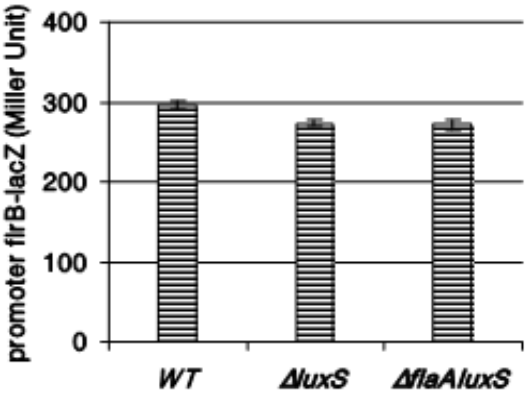


Fig.3 : Comparison of *flrB* expression among *luxS* mutant strain of *Vibrio cholerae* MO10 lac⁻ & wild type Transcription level of *flrB* was examined by β-galactosidase assay using *flrB promoter-lacZ* fusion transcriptional reporter construct

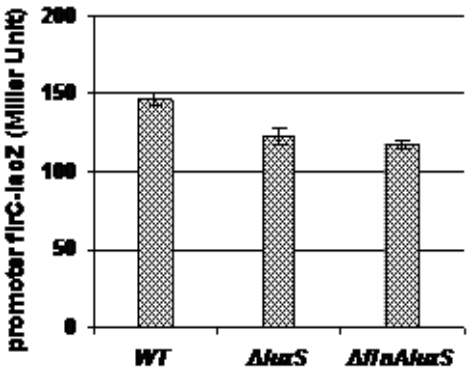


Fig. 4 : Comparison of *flrC* expression among *luxS* mutant strain of *Vibrio cholerae* MO10 lac⁻ & wild type. Transcription level of *flrC* was measured by Δ -galactosidase assay using *flrC promoter-lacZ* fusion transcriptional reporter construct

IV. Conclusion

It can be concluded that *luxS* gene may regulate the motility through the upregulation of trancription of *flrA* in *Vibrio cholerae* O139 Bengal strain MO10 lac⁻ but transcription of *flrB* and *flrC* were not influenced by *luxS* gene.

V. Acknowledgements

This work was supported by grant SR/SO/HS-43/2006 from Science and Engineering Research Council (SERC), Department of Science and Technology (DST), Government of India. We thank Dr. Sunando Bandyopadhyay for technical help.

References Références Referencias

1. González-Barrios, A. F., Zuo, R., Hashimoto, Y., Yang, Li., Bentley, W. E., & Wood, T. K. (2006). Autoinducer 2 Controls Biofilm Formation in *Escherichia coli* through a Novel Motility Quorum-Sensing Regulator (MqsR, B3022). *Journal of Bacteriology*, 188(1), 305-316.
2. Heidelberg, J. F., Eisen, J. A., Nelson, W. C., Clayton, R. A., Gwinn, M. L., Dodson, R. J., et al. (2000). DNA Sequence of both chromosomes of the cholera pathogen *Vibrio cholerae*. *Nature*, 406, 477-483.
3. Josenhans, C., & Suerbaum, S. (2002). The role of motility as a virulence factor in bacteria. *International Journal of Medical Microbiology*, 291, 605-614.
4. Klose, K. E., & Mekalanos, J. J. (1998a). Differential regulation of multiple flagellins in *Vibrio cholerae*. *Journal of Bacteriology*, 180, 303-316.
5. Kwok, S., Kellog, D. E., McKinney, N., Spasic, D., Goda, L., Levenson, C., & Sninsky, J. J. (1990). Effects of primer-template mismatches on the polymerase chain reaction: Human Immunodeficiency Virus 1 model studies. *Nucleic Acids Research*, 18, 999-1005.
6. Lospalluto, J. J., & Finkelstein, R. A. (1972). Chemical and physical properties of cholera exo-enterotoxin (choleragen) and its spontaneously formed toxoid (choleragenoid). *Biochemica et Biophysica Acta*, 257, 158-166.
7. Mekalanos, J. J., Swartz, D. J., Pearson, G. D., Harford, N., Groyne, F., & de Wilde, M. (1983). Cholera toxin genes: nucleotide sequence, deletion analysis and vaccine development. *Nature*, 306, 551-557.
8. Miller, J. H. (1992). *A short course in bacterial genetics* (2nd ed). New York: Cold Spring Harbor Laboratory Press.
9. Millikan, D. S., & Ruby, E. G. (2003). FlrA, a**σ54** - dependent transcriptional activator in *Vibrio fischeri,* is required for motility and symbiotic light-organ colonization. *Journal of Bacteriology*, 185, 3547-3557
10. Moisi, M., Jenul, C., Butler, S. M., New, A., Tutz, S., Reidl, J., Klose, K. E., Camilli, A., & Schild, S. (2009). A Novel Regulatory Protein Involved in Motility of *Vibrio cholerae*. *Journal of Bacteriology*, 191, 7027-7038

11. Osaki, T., Hanawa, T., Manzoku, T., Fukuda, M., Kawakami, H., Suzuki, H., et al. (2006). Mutation of *luxS* affects motility and infectivity of *Helicobacter pylori* in gastric mucosa of a Mongolian gerbil model. *Journal of Medical Microbiology*, 55, 1477-85.
12. Prouty, M. G., Correa, N. E., & Klose, K. E. (2001). The novel sigma54- and sigma28-dependent flagellar gene transcription hierarchy of *Vibrio cholerae*. *Molecular Microbiology*, 39, 1595-1609.
13. Rashid, M. H., Rajanna, C., Ali, A., Karaolis, D. K. R. (2003). Identification of genes involved in the switch between the smooth and rugose phenotypes of *Vibrio cholerae*. *FEMS Microbiology Letters*, 227, 113-119.
14. Ren, D., Bedzyk, L., Ye, R.W., Thomas, S., & Wood, T. K. (2004). Differential gene expression shows natural brominated furanones interfere with the autoinducer-2 bacterial signaling system of *Escherichia coli*. *Biotechnology Bioengineering*, 88, 630-642.
15. Richardson, K. (1991). Roles of motility and flagellar structure in pathogenicity of *Vibrio cholerae*: analysis of motility mutants in three animal models. *Infection & Immunity*, 59, 2727-2736.
16. Sambrook, J. & Russel, D. W. (2001). *Molecular cloning: a laboratory manual* (3rd ed). New York: Cold Spring Harbor Laboratory Press.
17. Simons, R. W., Houman, F., & Kleckner, N. (1987). Improved single and multicopy *lac*-based cloning vectors for protein and operon fusions. *Gene*, 53, 85-96.
18. Sperandio, V., Torres, A. G., Giron, J. A., & Kaper, J. B. (2001). Quorum sensing is a global regulatory mechanism in enterohemorrhagic *Escherichia coli* O157:H7. *Journal of Bacteriology*, 183, 5187-5197.
19. Stewart, B. J., & McCarter, L. L. (1996). *Vibrio parahaemolyticus* FlaJ, a homologue of FliS, is required for production of a flagellin. *Molecular Microbiology*, 20, 137-149.
20. Taylor, R. K., Miller, V. L., Furlong, D. B., & Mekalanos, J. J. (1987). Use of phoA gene fusions to identify a pilus colonization factor coordinately regulated with cholera toxin. *Proceedings of the National Academy of Science of United States of America*, 84, 2833-2837.
21. Watnick, P. I., & Kolter, R. (1999). Steps in the development of a *Vibrio cholerae* El Tor biofilm. *Molecular Microbiology*, 34, 586-595.
22. Watnick, P. I., Lauriano, C. M., Klose, K. E., Croal, L., & Kolter, R. (2001). The absence of a flagellum leads to altered colony morphology, development and virulence in *Vibrio cholerae* O139. *Molecular Microbiology*, 39, 223-235.
23. Yildiz, F. H., & Schoolnik, G. K. (1999). *Vibrio cholerae* O1 El Tor: identification of a gene cluster required for the rugose colony type, exopolysaccharide production, chlorine resistance, and biofilm formation. *Proceedings of the National Academy of Science of United States of America*, 96, 4028-4033.

This page is intentionally left blank

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Aqueous extract of Cryptolepis sanguinolenta enhance cytochrome P450 1A isozyme activity in presence of Atesunate

By Ocloo, Augustine, Sakyiamah, M. Maxwe, Adjimani, P. Jonathan, Sittie & A. Archibald
University of Ghana

Abstract – The clinical response to drugs may be affected by the simultaneous administration of other drugs that modify the pharmacokinetics and the disposition profile of medications. Drug metabolism via the cytochrome P450 (CYP) system has emerged as an important determinant in the occurrence of several drug-drug interactions. In our earlier studies, Cryptolepis sanguinolenta was reported to cause sub therapeutic blood levels of dihydroartemisinin of artesunate which could lead to decreased effectiveness, and possibly resistance as a result of herb-drug interactions. However, the role of metabolism in such herb-drug interaction has not been studied.

Keywords : *Co-current administration, Cryptolepis sanguinolenta, metabolism, cytochrome P450, artesunate.*

GJMR-D Classification : *NLMC Code: QU 135*

Strictly as per the compliance and regulations of:

Aqueous extract of Cryptolepis sanguinolenta enhance cytochrome P450 1A isozyme activity in presence of Atesunate

Ocloo, Augustine[α], Sakyiamah, M. Maxwe, Adjimani[σ], P. Jonathan[ρ] & Sittie & A. Archibald[ω]

Abstract - The clinical response to drugs may be affected by the simultaneous administration of other drugs that modify the pharmacokinetics and the disposition profile of medications. Drug metabolism via the cytochrome P450 (CYP) system has emerged as an important determinant in the occurrence of several drug-drug interactions. In our earlier studies, *Cryptolepis sanguinolenta* was reported to cause sub therapeutic blood levels of dihydroartemisinin of artesunate which could lead to decreased effectiveness, and possibly resistance as a result of herb-drug interactions. However, the role of metabolism in such herb-drug interaction has not been studied.

Aim: The present study was therefore aimed at determining the effect of *Cryptolepis sanguinolenta* administration on the metabolism of artesunate.

Methods: Reconstituted freeze dried *Cryptolepis sanguinolenta* was administered in drinking water at the therapeutic dose of 36 mg/kg body weight for two weeks, followed by a single oral dose of artesunate (150 mg/kg body weight). All the animals were sacrificed by cervical dislocation after 24 hr. Liver was excised and microsomes prepared and activities of PNPH, AmD and NOD were determined as a measure of CYP2E1, CYP2B1 and CYP1A activities respectively.

Results: Concurrent administration of *C. sanguinolenta* and artesunate significantly enhanced the activity of CYP1A.

Keywords : Co-current administration, Cryptolepis sanguinolenta, metabolism, cytochrome P450, artesunate.

I. Introduction

The clinical response to drugs may be affected by the simultaneous administration of other drugs that modify the pharmacokinetics and the disposition profile of medications[1]. Many drugs affect CYP enzymes by either inducing the biosynthesis of CYP isoenzymes or by directly inhibiting the activity of the CYP isoenzymes, thus affecting the metabolism or clearance of the other drugs[2]. Inhibition of enzyme activity may result in higher concentrations and/or prolonged half-life of the substrate drug, which enhances the potential for toxic side effects. The clinical significance of a specific drug interaction depends on the degree of accumulation of the substrate and the therapeutic window of the substrate[3]. Enzyme induction on the other hand, is associated with an increase in enzyme activity. Fo drugs that are substrates of the isoenzyme induced, the effect is to lower the concentration of these substrates. The clinical consequence of the presence of an inducing agent and the resultant decrease in concentration of the substrate may mean a loss of efficacy[4].

Secondary plant metabolites share the biotransformation pathways of most chemicals and synthetic drugs. Consequently, this leads to a competitive inhibition of metabolic enzymes if herbal products are administered with drugs that are metabolized by the same enzymes[5]. For instance, studies have shown that St John's wort causes induction of drug metabolizing enzymes, including CYP2C9 which can lead to, for example, potential loss of efficacy of warfarin and phenprocoumon; CYP2C19 and CYP1A2 which can also lead to potential loss of efficacy of theophylline[6].

In our earlier studies, *Cryptolepis sanguinolenta* was reported to cause sub therapeutic blood levels of dihydroartemisinin of artesunate which could lead to decreased effectiveness, and possibly resistance as a result of herb-drug interactions[7]. However, the role of metabolism in such herb-drug interaction has not been studied. To this end, the present study was aimed at determining the effect of *Cryptolepis sanguinolenta* administration on the metabolism of artesunate.

II. Methods

A total of twenty-four (24) male Sprague - Dawley rats weighing between 298 – 343 g were obtained from the Animal Unit of the Centre for Scientific Research into Plant Medicine (CSRPM), Mampong Akuapim, Ghana and randomly divided into four groups

Authors α : Department of Biochemistry, Cell and Molecular Biology, Faculty of Science, P. O. Box LG4, University of Ghana, Legon-Accra, Ghana. E-mail : aocloo@ug.edu.gh
Authors σ : Department of Biochemistry, Cell and Molecular Biology, Faculty of Science, P. O. Box LG4, University of Ghana, Legon-Accra, Ghana.E-mail : maxi2g2@yahoo.com
Authors ρ : Department of Biochemistry, Cell and Molecular Biology, Faculty of Science, P. O. Box LG4, University of Ghana, Legon-Accra, Ghana.E-mail : Adjimani@ug.edu.gh
Authors ω: Centre for Scientific Investigation Research into Plant Medicine, P. O. Box 73, Mampong-Akuapeng, Ghana.
E-mail : aasittie@hotmail.com

of six. They were fed on standard laboratory chow diet obtained from Ghana Agro Food Company (GAFCO), Tema, Ghana and water ad libitum and acclimatized for a week.

One group (No drug) received water throughout the study. A second group (Cs ext) was administered reconstituted freeze dried *Cryptolepis sanguinolenta* in their drinking water at the therapeutic dose (36 mg/kg) (CSRPM, unpublished data) for two (2) weeks and single oral dose of the extract at the end of the two weeks, a third group (Artesunate) was given water for two weeks and as a single dose of Artesunate (150 mg/kg based on the recommended dosage in humans) after two weeks and a fourth group (Cs + Artesunate) received the reconstituted extract for two weeks and single oral dose of artesunate at the end of the two weeks. Studies were conducted in accordance with internationally accepted principles for laboratory animal use and care.

The reconstituted sample was prepared by obtaining a powdered dried root (360 g) of *Cryptolepis sanguinolenta* from the Centre for Scientific Research into Plant Medicine, Mampong, Ghana. This was boiled in 6 liters of water for 45 min and cooled. The resultant extract was filtered through a cotton wool, pre-frozen and lyophilized into powder using a freeze dryer (EYELA, Tokyo Rikakikai Co LTD, Japan). The extract was then stored in a cool dry place, in a desiccator at room temperature and was reconstituted in sterilized distilled water before administration.

All the animals were sacrificed by cervical dislocation after 24 h of final drug administration and liver was excised, weighed, hepatic microsomes prepared and activity of cytochrome c reductase was determined in addition to activities of PNPH, AmD and NOD as a measure of CYP2E1, CYP2B1 and CYP1A activities respectively.

Hepatic microsomes of control (no drug) and treatment groups were prepared from tissue homogenate (20 % w/v) according to method of Lake[8] as modified by Anjum et al[9] by $CaCl_2$ precipitation of the post-mitochondrial fraction and centrifugation at 27,000 g for 15 min and the resulting microsomal pellet was washed in a 0.1M Tris buffer, pH 7.4 containing 0.15 M KCl and centrifuged at 27,000 g for 15 min in a high-speed Avanti J-E refrigerated centrifuge (Beckman Coulter Inc, USA). The microsomes were stored in aliquots of 1 ml at – 40 ˚C.

The microsomal protein contents were then determined spectrophotometrically at 595 nm by the Bradford method[10] using bovine serum albumin (BSA) as standard.

Cytochrome c Reductase activity was determined as described previously[11]. The reaction mixture included 250 µl of 5 mg/ml cytochrome c, 631 µl of 4 mg/ml microsomal sample and made up to 2.3 ml with 0.1 M tris-HCl buffer, pH 7.4. The reaction was initiated by the addition of 250 µl of 2 % (w/v) NADPH solution. A reference blank with similar composition as the reaction mixture, except that the NADPH was replaced by an equal volume of 0.1 M Tris buffer pH 7.4 was prepared and absorbance at 550 nm was recorded every minute for 3 min against the reference blank and the NADPH – cytochrome c reductase activity was calculated as described previously[11].

Para-Nitrophenol Hydroxylase (PNPH) activity was determined by the method of Reinke and Meyer[12]. The reaction mixture consisted of 10 µl of 1.4 mg/ml para-Nitrophenol (PNP), 5 µl of 5 mM MgCl2, 776 µl of 4 mg/ml microsomal sample and made up to 1.0 ml with 50 mM Tris buffer, pH 7.4. This was incubated at 37 ˚C for 3 min and 10 µl of 50 mM NADPH was added to initiate the reaction and was again incubated for a further 10 min at 37 ˚C, after which 0.5 ml of 0.6 M $HClO_4$ was added to stop the reactions. A blank with similar composition as the reaction mixture, except that the microsomal sample was replaced with an equal volume of distilled water and incubated for 3 min at 37 ˚C.

Aminopyrine - N - Demethylase (AmD) activity was measured by determining the production of formaldehyde[13]. The reaction mixture included 0.2 ml of 50 mM semicarbazide HCl, 0.8 ml of 2.5 mM NADPH and 0.5 ml 20 mM aminopyrine. The mixture was incubated at 37 ˚C for 2 min, in a shaking water bath. The enzyme reaction was initiated by adding 0.5 ml of diluted microsomal fraction (containing 4 mg/ml protein) to yield a final concentration of 1 mg/ml protein in the reaction mixture. The incubation was continued at 37 ˚C for a further 30 min. Aminopyrine was substituted for equal volume of distilled water in the blank which contained other constituents of the reaction mixture. The reaction was stopped by adding 0.5 ml of 25 % w/v ZnSO4, thoroughly mixed and kept on ice for 5 min. To the mixture, 0.5 ml of saturated $Ba(OH)_2$ was added and centrifuged for 5 min at maximum speed, using the Denly bench centrifuge (BS 400, England), after a second round of mixing and cooling on ice. To 1 ml of the supernatant, 2 ml of Nash reagent (prepared from a mixture of 30 g ammonium acetate, 0.4 ml acetyl acetone and then made up to 100 ml with distilled water) was added and incubated at 60 ˚C for 30 min after tightly capping the test tubes. The solutions were extensively cooled and the absorbance read at 415 nm against the blank. A standard curve over the range of 0 – 0.1 mM formaldehyde was prepared using distilled water. The standard was subjected to the same treatment with the Nash reagent as the supernatant. The specific activity was determined as the formaldehyde formed per incubation time per total protein (in reaction mixture) in nmol/min/mg.

The 4- Nitroanisole – O – Demethylase (NOD) activity was determined by measuring the 4- nitrophenol produced[14]. The reaction mixture included 1 ml of 2 mM

NADPH and an equal volume of microsomal dilution (containing a 4 mg/ml protein) and incubated at 37 ˚C for 2 min in a shaking water bath. The enzyme reaction was initiated with 10 µl of 500 mM 4 – Nitroanisole and incubated again for 15 min. A blank was prepared as the reaction mixture except that the microsomal proteins were denatured at 100 ˚C. The enzyme reaction was terminated with 1 ml of ice - cold 20 % w/v TCA and allowed to stand on ice for 5 min.

III. Statistical Analysis

The results were expressed as mean ± standard error of the mean (SEM). Significance of the difference between the control and test values was evaluated using analysis of variance (ANOVA). This was done using the computer programme 'Statistical Package for Social Sciences (SPSS), version 16.0. P – Value less than 0.05 ($p < 0.05$) was taken as the significance level.

IV. Results

The effect of drug and herb administration on rat hepatic microsomal protein content is as shown in table 1. The hepatic microsomal protein content of all the treatment groups decreased compared to the control group (no drug). Even though *C. sanguinolenta* administration resulted in a significant decrease (46.4%, $p = 0.017$), the extract did not cause a significant change in microsomal protein content in presence of artesunate (Table 1).

Figure 1 shows the effect of concurrent administration of *C. sanguinolenta* and artesunate on rat hepatic microsomal cytochrome c reductase activity. All the treatments resulted in a decrease in cytochrome c reductase activity relative to the control (no drug). *C. sanguinolenta* treated and *C. sanguinolenta*-artesunate treated groups showed 18.1% ($p = 0.97$) and 10.7% ($p = 1.0$) decrease in the enzyme activity, respectively. Artesunate treated group showed a higher but non-significant decrease (40.2%) in the cytochrome c reductase activity. The *C. sanguinolenta* extract did not significantly alter the cytochrome c reductase activity in presence of artesunate.

The effect of concurrent administration of *C. sanguinolenta* and artesunate on para-Nitrophenol Hydroxylase (pNPH) activity as measure of CYP2E1 activity is as shown in Figure 2. All the treatment groups showed a slight but non-significant ($p > 0.05$) increase in enzyme activity except *C. sanguinolenta* treated group which did not change the enzyme activity compared to the controls (no drug). The activities in Artesunate treated and *C. sanguinolenta-artesunate* treated groups increased by 19.5% and 20.5% respectively, but this was non-significant ($p > 0.05$) compared to the control group (no drug). Again the concurrent administration of the extract did not significantly alter the activity of CYP2E1 in presence of Artesunate.

Figure 3 shows the effect of concurrent administration of *C. sanguinolenta* and artesunate on rat hepatic microsomal Aminopyrine N- Demethylase (AmD) activity as measure of CYP2B1 activity. Again adminsitartion of *C. sanguinolenta* did not significantly alter CYP2B1 activity in presence of Artesunate though artesunate alone caused a slight but non-significant decrease (16.1%, $p > 0.05$) compared to the control group (no drug). However, the extract alone significantly increased the activity of the isozyme.

The effect of concurrent administration of *C. sanguinolenta* and artesunate on rat hepatic microsomal 4- Nitroanisole - O - Demethylase (NOD) activity as measure of CYP1A is shown in Figure 4. Artesunate administration caused a significant increased in the CYP1A enzyme activity (150.9% increase, $p = 0.037$) relative to the controls (no drug) and concurrent administered with *C. sanguinolenta* caused a further significant increase in the enzyme activity relative to both the artesunate alone treated group (22.6%, $p = 0.028$ increase) and the control (207.7%, increase, $p = 0.012$). Thus, administration of the extract caused a significant increase in activity of the isozyme in presence of Artesunate.

V. Discussion

The clinical response to drugs may be affected by the simultaneous administration of other drugs that modify the pharmacokinetics and the disposition profile of medications[1]. Artemisinin and its derivatives (artemether, artesunate, arteether, deoxyartemisinin and dihydroartemisinin) have been reported to undergo hepatic metabolism[15]. These classes of drugs are found to affect several principal CYP enzymes. Although the metabolic changes are usually moderate, in several cases such effects are shared by all five endoperoxides suggesting a class effect[16]. In the present study, the PNPH activity did not change significantly after treatment with artesunate in the absence or presence of extract. This suggests that artesunate is probably not a substrate of CYP2E1.

Artesunate slightly decreased (16.1%) the activity of AmD, though not significantly relative to the no-drug controls (Fig 3). In the presence of *C. sanguinolenta*, however, artesunate did not affect the activity of AmD although the extract alone significantly increased the enzyme activity (Fig 3). This suggests a slight inhibitory effect of artesunate on CYP2B1. CYP2B1 of rats is analogous to CYP2B6 in humans[17]. Contrary to the findings in the present study, the hepatic metabolism of artesunate has been reported to be partially mediated by CYP2B6 in humans[16]. The exact mechanism of induction is not known. However, the enzyme might be induced via an increase in mRNA

expression and/or activation of existing enzymes. Also, CYP2B proteins are reported to be down-regulated in primary cultures of rat hepatocytes by two independent mechanisms in response to lipopolysaccharide (LPS): NO-independent mRNA suppression at lower concentrations and NO-dependent protein suppression at higher concentrations[18]. The significant increase in the activity of AmD after *C. sanguinolenta* treatment suggests that the extract is probably a substrate of CYP2B1 (Fig 3). It was therefore expected that the activity of CYP2B1 after pre-treatment with *C. sanguinolenta* before artesunate would at least be comparable to *C. sanguinolenta* alone treated group.

On the contrary, the AmD activity after administration of artesunate in the presence of *C. sanguinolenta* decreased (35.7%, $p < 0.05$) relative to the *C. sanguinolenta* treated group (Fig 3). This observation therefore suggests that whereas *C. sanguinolenta* possibly induces the expression of CYP2B1 mRNA, artesunate probably inhibit the activation of the proteins. The apparent inhibitory effect of artesunate observed in the present study as compared to other studies could be due to species variations and probably concentration effect of artesunate. Artesunate was given as a single oral dose (150 mg/kg) unlike the earlier studies where multiple doses were given.

Artesunate administration increased the NOD activity significantly relative to the no-drug controls in the present study (Fig 4) and upon concurrent administration with *C. sanguinolenta* and artesunate, there was a further significant increase (22.6%, $p = 0.028$) in the enzyme activity relative to the artesunate treated group and 207.7% ($p = 0.012$) compared to the no-drug controls. This suggests that artesunate is a possible substrate of CYP1A and also tend to have an enhanced activity in the presence of the extract. *C. sanguinolenta* could be a possible allosteric modulator of CYP1A in presence of Artesunate. Artemether and dihydroartemisinin (DHA) have been reported to be metabolized in vitro by CYP1A, CYP2B6, CYP2C19 and CYP3A4[18]. [16] Thus activation of CYP1A after administration of artesunate agrees with the earlier findings by Navaratnam et al.[18] since the DHA was the major metabolite of artesunate and also artemisinin and its derivatives undergo class effect when it comes to metabolism via CYP enzymes[16].

The CYP mediated metabolism of artesunate was enhanced as a result of induction of CYP1A by *Cryptolepis sanguinolenta*. The enhanced activation of CYP1A after concurrent administration of *C. sanguinolenta* and artesunate (Fig 4) probably explains the observed decrease in the AUC (a measure of the bioavailability in blood) and half life (T1/2) with the corresponding increase in elimination rate and clearance as indicated in our earlier publication.[7] However, it is possible that esterase activity might play a role in the metabolism of artesunate/dihydroartemisinin (DHA) though measures such as the use of anticoagulant containing tubes for collection of whole blood and storage at -80 °C were put in place to reduce such possible effect.

VI. Conclusion

The present study shows that metabolism of DHA, the major metabolite of artesunate, was significantly enhanced after concurrent administration of C. sanguinolenta and artesunate. This observation suggests that the effectiveness of artesunate after co-administration of C. sanguinolenta and artesunate may be affected as a result of rapid flush out of the drug leading to sub-therapeutic levels, a major factor for drug resistance.

VII. Acknowledgement

The authors are very grateful to the Centre for Scientific Research into Plant Medicine, Mampong-Akuapeng for providing both financial and material resources for the study. AS, was supported by the Centre for Scientific Research into Plant Medicine. AO, MMS and JPA were supported by University of Ghana. We are also grateful to the technicians at the Department of Biochemistry, University of Ghana and the Centre for Scientific Research into Plant Medicine. Finally, we thank Dr. Kojo Gbewonyo and Mr. Emmanuel Koomson for their assistance.

References Références Referencias

1. Di, YM, Li, CG, Xue, CC, Zhou, SF. Clinical drugs that interact with St. John's wort and implication in drug development. Curr Pharm Des. 2008; 14(17):1723-42
2. Zhou, SF, Zhou, ZW, Li, CG, Chen, X, Yu, X. Identification of drugs that interact with herbs in drug development. Drug Discovery Today, 2007; 12: 664-673.
3. Bachmann, K, Lewis, JD. Predicting inhibitory drug-drug interactions and evaluating drug interaction reports using inhibition constants. Ann Pharmacother. 2005; 39: 1064-72.
4. Leucuta, SE, Vlase, L. Pharmacokinetics and Metabolic Drug Interactions Current Clin Pharmacol. 2006; 1(1) 5-20.
5. Nowack, R, Andrassy, J, Fischereder, M, Unger, M. Effects of Dietary Factors on Drug Transport and Metabolism: The Impact on Dosage Guidelines in Transplant Patients. Clin pharmacol & Therapeu. 2009; 85(4): 439-443
6. Tirona, RG, Bailey, DG. Herbal product–drug interactions mediated by induction Br J Clin Pharmacol. 2006; 61 :6 677–681
7. Sakyiamah, MM, Ocloo, A, Adjimani, JP, Sittie, A. Effect of Aqueous Extract of Cryptolepis

8. Sanguinolenta on the Pharmacokinetics of Artesunate. Int J Pharm Sci Drug Res. 2011; 3(4): 313-318
9. Lake, BG. Preparation and characterization of microsomal fractions for studies on xenobiotic metabolism. In Biochemical Toxicology, A Practical Approach. K. Snell and B. Mullock (ed.), IRL Press, Oxford, 1987; pp 182-215.
10. Anjum, F, Raman, A, Shakoori, AR, Gorrod, JW. An Assessment of cadmium toxicity on cytochrome P450 and flavin monooxygenase-mediated metabolic pathways of dimethylaniline in male rabbits. J. Environ. Pathol. Toxicol. Oncol. 1992; 11: 191-195.
11. Bradford, M. A rapid and sensitive method for the quantification of microgram quantities of protein utilizing the principle of protein-dye binding. Anal Biochem. 1976; 72:248- 254.
12. William, CHJ, Kamin, H. Microsomal triphosphopyridine nucleotide-cytochrome c reductase of liver. J Biol Chem. 1962; 237: 587-595
13. Reinke, LA, Meyer, MJ. p-Nitrophenol hydroxylation: a microsomal oxidation which is highly inducible by ethanol. Drug Metab. Dispos. 1985; 13:548-55
14. Nash, T. The colorimetric estimation of formaldehyde by means of the Hamtzch reaction. Biochem J. 1953; 55: 416-421
15. Kato, R, Gillette, JR. Effect of starvation on NADH-dependent enzymes in liver microsomes of male and female rats. J. Pharmacol. Exp. 1965; 150: 279.
16. Svensson, US, Ashton, M. Identification of the human cytochrome P450 enzymes involved in the in vitro metabolism of artemisinin. Br. J. Clin. Pharmacol. 1999; 48: 528–535.
17. Asimus, S, Elsherbiny, D, Hai, TN, Jansson, B, Huong, NV, Petzold, MG, Simonsson, US, Ashton, M. Artemisinin antimalarials moderately affect Cytochrome P450 enzyme activity in healthy subjects. Fundam Clin Pharmacol. 2007; 21(3): 307-316.
18. Lee, C, Kim, B, Li, L, Morgan, ET. Nitric Oxide-dependent Proteasomal Degradation of Cytochrome P450 2B Proteins. J Biol Chem. 2008; 283(2): 889–898
19. Navaratnam, V, Mansor, SM, Sit, NW, Grace, J, Li, Q, Olliaro, P. Pharmacokinetics of artemisinin-type compounds. Clin Pharmacokinet., 2000; 39 (4); 255-70.

Experimental Group	No Drug	Cs ext	Artesunate	Cs ext + Artesunate
Microsomal Protein Content (mg/ml)	0.09 ± 0.01	0.05 ± 0.01*	0.06 ± 0.02	0.06 ± 0.02

Table 1: Effect of concurrent administration of *C. sanguinolenta* and artesunate on microsomal protein content in rats. Values are Mean ± SEM for six samples. * Value significantly different ($p < 0.05$) from the control group (no drug)

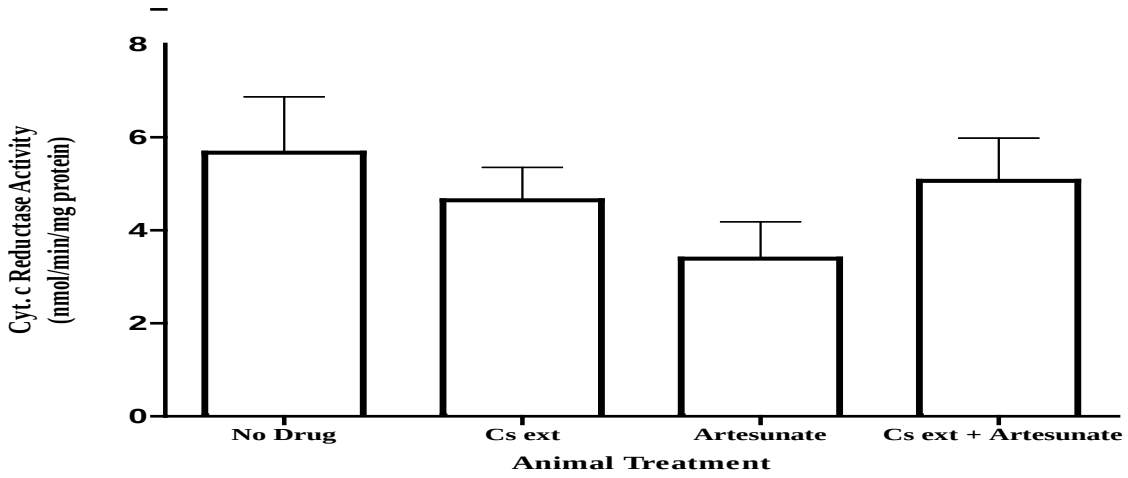


Fig. 1: Effect of concurrent administration of C. sanguinolenta and artesunate on rat hepatic microsomal cytochrome c reductase activity

Aqueous extract of Cryptolepis sanguinolenta aqueous at concentration of 36 mg/kg body weight was administered for two weeks after which a single dose of artesunate (150 mg/kg body weight) was administered.

Control group were given only the single dose of artesunate. Values are Mean ± SEM for six samples. * Value significantly different ($p < 0.05$) from the control group (no drug). CS ext – C. sanguinolenta aqueous extract.

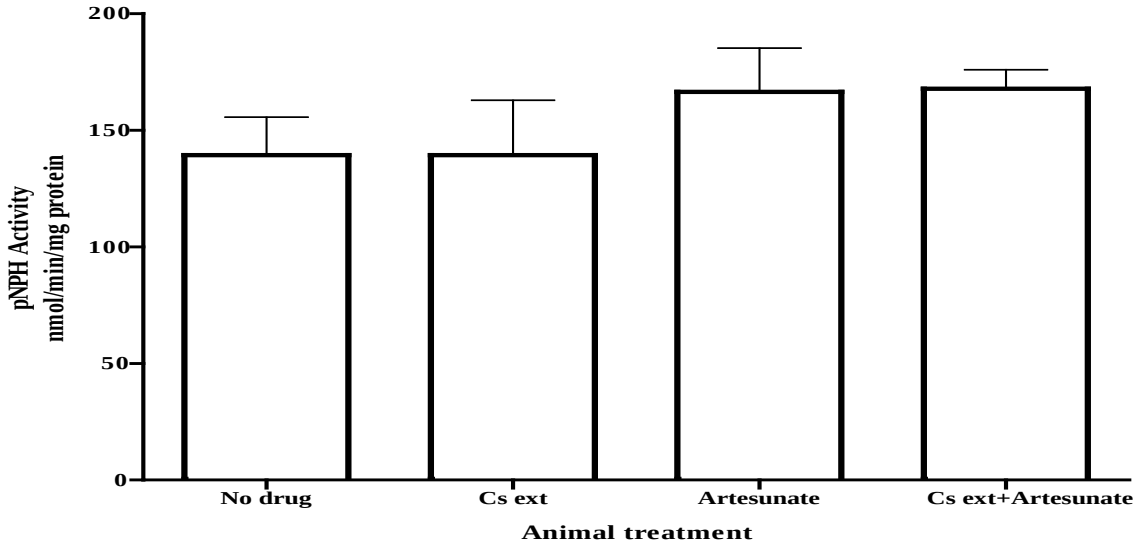


Fig. 2 : Effect of concurrent administration of C. sanguinolenta and artesunate on rat hepatic microsomal PNPH activity

Aqueous extract of Cryptolepis sanguinolenta aqueous at concentration of 36 mg/kg body weight was administered for two weeks after which a single dose of artesunate (150 mg/kg body weight) was administered. Control group were given only the single dose of artesunate. Values are Mean ± SEM for six samples. * Value significantly different ($p < 0.05$) from the control group (no drug). CS ext – C. sanguinolenta aqueous extract.

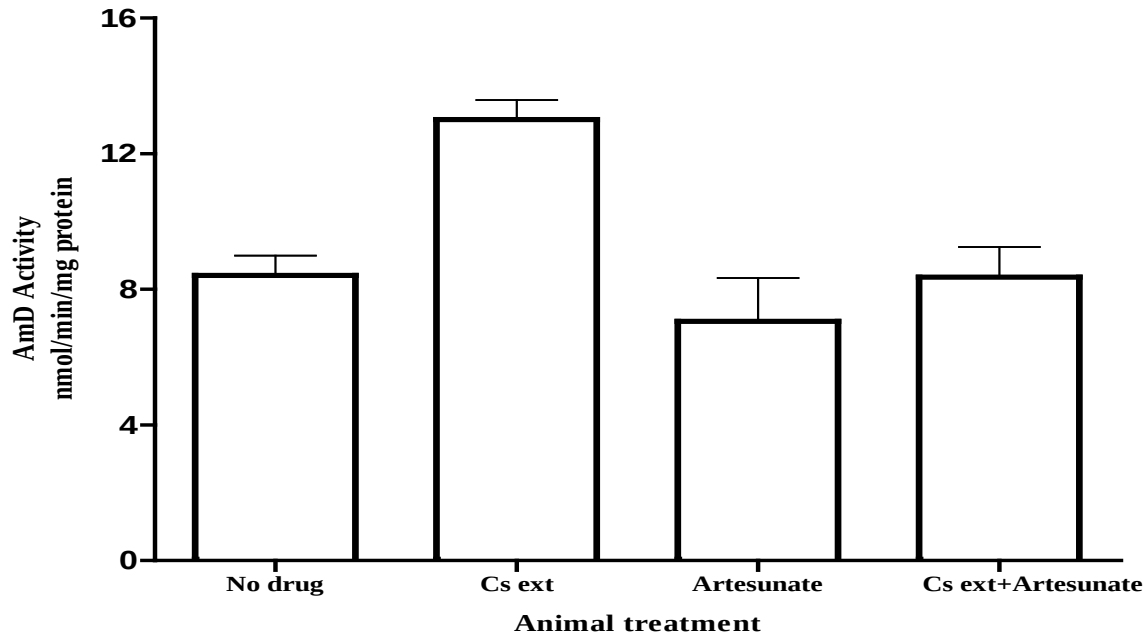


Fig. 3 : Effect of concurrent administration of C. sanguinolenta and artesunate on rat hepatic microsomal AmD activity.

Aqueous extract of Cryptolepis sanguinolenta aqueous at concentration of 36 mg/kg body weight was administered for two weeks after which a single dose of artesunate (150 mg/kg body weight) was administered. Control group were given only the single dose of artesunate. Values are Mean ± SEM for six samples. * Value significantly different ($p < 0.05$) from the control group (no drug). CS ext – C. sanguinolenta aqueous extract.

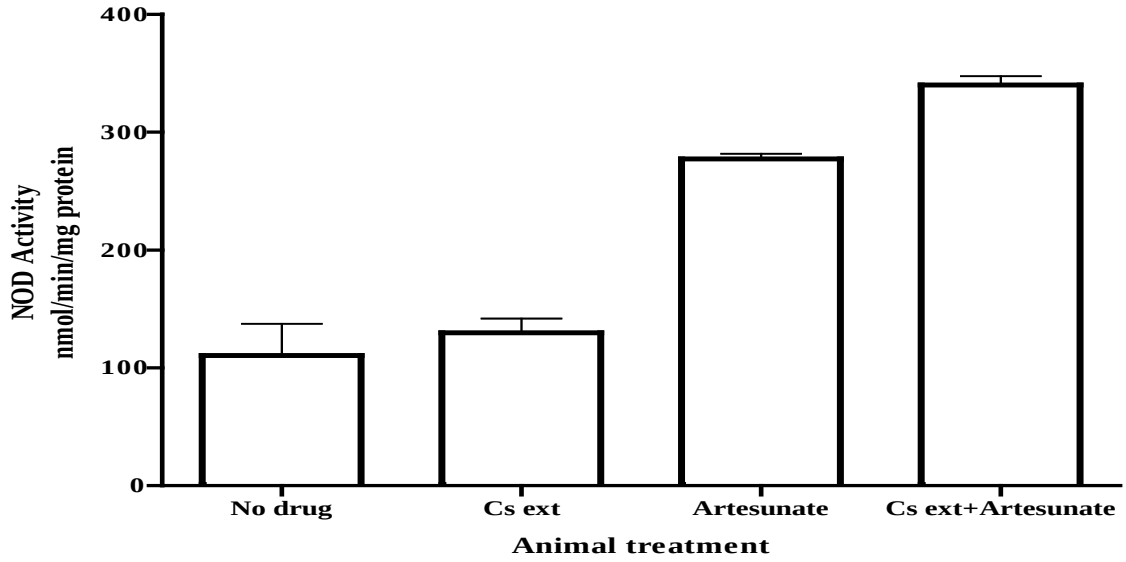


Fig. 4: Effect of concurrent administration of C. sanguiolenta and artesunate on rat hepatic microsomal NOD activity

Aqueous extract of Cryptolepis sanguinolenta aqueous at concentration of 36 mg/kg body weight was administered for two weeks after which a single dose of artesunate (150 mg/kg body weight) was administered. Control group were given only the single dose of artesunate. Values are Mean ± SEM for six samples. * Value significantly different ($p < 0.05$) from the control group (no drug). ◊ Value significantly different ($p < 0.05$) from the artesunate treated group. CS ext – C. sanguinolenta aqueous extract.

Global Journal of Medical Research Volume XII Issue V Version I June 2012

This page is intentionally left blank

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Treadmill and Bicycle Ergometer Exercise: Cardiovascular Response comparison

By Dr Ravikiran Kisan MD, Dr Swapnali Ravikiran Kisan MD,
Dr Anitha OR MD & Dr Chandrakala SP MD

University of Ibadan

Abstract – Exercise is inevitable to keep health in good status. There are few scientific studies to show the differences between different types of exercises in health and disease. In our study we compared the treadmill exercise and bicycle ergometer exercise and their effect on maximum heart rate attained, systolic blood pressure and diastolic blood pressure in twenty one healthy volunteer aged between eighteen to twenty years. We recorded these subjects's blood pressure before exercise and after exercise; heart rate before exercise, during exercise and after exercise. Also we enlisted the advantages and disadvantages of treadmill exercise and bicycle ergometer exercise, so that these two types of exercise can be appropriately used for health promotion, diagnosis of diseases and for rehabilitation of the individuals.

Keywords : *Treadmill exercise, bicycle ergometer exercise, maximum heart rate, blood pressure.*

GJMR-B Classification : *NLMC Code: WK 810, WK 835, WK 815, WQ 248*

Strictly as per the compliance and regulations of:

Treadmill and Bicycle Ergometer Exercise: Cardiovascular Response Comparison

Dr Ravikiran Kisan MD [α], Dr Swapnali Ravikiran Kisan MD [σ], Dr Anitha OR MD [ρ]& Dr Chandrakala SP MD [ω]

Abstract - Exercise is inevitable to keep health in good status. There are few scientific studies to show the differences between different types of exercises in health and disease. In our study we compared the treadmill exercise and bicycle ergometer exercise and their effect on maximum heart rate attained, systolic blood pressure and diastolic blood pressure in twenty one healthy volunteer aged between eighteen to twenty years. We recorded these subjects's blood pressure before exercise and after exercise; heart rate before exercise, during exercise and after exercise. Also we enlisted the advantages and disadvantages of treadmill exercise and bicycle ergometer exercise, so that these two types of exercise can be appropriately used for health promotion, diagnosis of diseases and for rehabilitation of the individuals.

Keywords : Treadmill exercise, bicycle ergometer exercise, maximum heart rate, blood pressure.

I. Introduction

Exercises are advised for health promotion, and prophylaxis for many cardiovascular diseases and also for rehabilitation after an episode of disease. Among the exercises aerobic exercises are appropriate for these purposes. To do aerobic exercise many methods are available for example: running, jogging, walking, cycling and others. Among different modes of exercises in the modern busy life, the bicycle ergometer and treadmill exercises are the commonest to perform as indoor aerobic exercises. In motor driven treadmill exercise which is similar to walking or jogging or running depending upon the speed of the treadmill motor. In case of bicycle ergometer exercise similar to cycling, the amount of exercise can be controlled voluntarily by pedaling the cycle with predefined resistance. Bicycle ergometer exercise and treadmill exercise will save the time to go to open space to perform aerobic exercises and space utilized for the same were also less. Apart from regular exercise these methods are also used in the performance of multistage sub-maximal or maximal stress testing (1). Both treadmill and bicycle ergometer exercise have their own advantages. But, in long term exercise practices interchanging of treadmill and bicycle ergometer exercise is not advisable especially if it was advised as therapy.

Hence present study was undertaken to study the cardiovascular responses for treadmill exercise and bicycle ergometer exercise.

II. Materials and Methods

The present study was conducted in semi urban city of south India, after obtaining institutional ethics clearance. The procedure was explained to the subjects and were recruited after obtaining informed written consent. For this study twenty one male volunteers were recruited. These subject's detailed history and general physical and clinical examination was done to rule out any underlying disease. Subjects with any known medical or surgical illness or physical disability were excluded from this study.

The age group of subjects was ranged between 18 years to 20 years. These twenty one male subjects were not trained athletes or sportspersons and were not taking any medications. Between 9am to 11am each subjects underwent exercise tests for two days. They had light breakfast atleast 3 hours prior to exercise testing and atleast 24 hours of abstinence from any form of alcohol, tobacco, tea, coffee. They had not under gone any strenuous work or exercises before test. Subjects were divided into two groups randomly by picking the folded covered slips into group A and Group B. There were 10 subjects in group A and 11 subjects in group B. Test was performed for each subject in two days. Group A performed treadmill exercise and Group B performed bicycle ergometer exercise on the first day. On next day the exercising group were interchanged i.e. Group A performed bicycle ergometer exercise and Group B performed treadmill exercise. Cardiovascular parameter like blood pressure was recorded by using mercury sphygmomanometer and heart rate was counted by auscultating at the apex of heart. BP and HR were recorded at resting state and immediately after the exercise. For this study we used a motor driven treadmill and mechanically braked bicycle ergometer. Comparison of different cardiovascular parameters between treadmill and bicycle ergometer exercise were made at equivalent oxygen uptake values (2) i.e. at 17.5 ml / kg / min oxygen uptake (1;3). In treadmill exercise subjects were made to walk at the speed of 1.7mph

Author α: Assistant professor, Department of Physiology, SSIMS & RC, Davangere, Karnataka, India. (Telephone: + 91 9945447207 E-mail : drravikirankisan@gmail.com)
Author σ : Assistant professor, Department of Biochemistry, SSIMS & RC, Davangere, Karnataka, India.
About ρ : Assistant professor, Department of Physiology, SIMS & RC, Bangalore, Karnataka, India.
Author ω: Assistant professor, Department of Anatomy, Sri Siddarth Medical College, Agalkote, BH Road, Tumukur, Karnataka, India.

(2.8km/h) at 10 degree elevation for 3min (1;3). In bicycle ergometer exercise pedaling is done at the speed of 60 times / min, with breaking resistance of 1.75kg, for 3min to do work done of 450kpm / min (1;3).

III. Results

Results of the present study are elaborated in Table 1

IV. Dicussion

Body response to exercise depends on the type of exercise. Cardiovascular changes again depend on the type of exercise and severity of exercises. Cardiovascular responses differ in bicycle ergometer exercise and treadmill exercise as the method of exercise, exercising muscles and others (as listed below) differ. Other studies have shown that increase in heart rate was more in treadmill exercise compared to bicycle ergometer exercise (2;4-6). Systolic blood pressure will increase more in treadmill exercise compared to bicycle ergometer exercise (3;5). Diastolic blood pressure decreases in both type of exercises but the decrease was same in both groups (3;5;7). Change in blood pressure and heart rate response in treadmill exercise was more compared to bicycle ergometer exercise for a given equivalent oxygen uptake values due to more sympathetic activation.

Difference between treadmill exercise and bicycle ergometer exercise:

- Bicycle ergometer is more economic compared to treadmill,
- Bicycle ergometer occupies less space compared to treadmill,
- Bicycle ergometer does not require electricity to run where as treadmill does require electricity,
- Upper body motion is less in bicycle ergometer, hence easy to record the vital signs and to collect blood samples (8),
- Bicycle ergometer is less familiar compared to treadmill walking (1),
- Subjects body weight does not influences the exercise capacity in bicycle ergometer whereas work rate is dependent on body weight in treadmill exercise (9),
- Smaller muscle mass is involved in bicycle ergometer exercise (10),
- Work load in bicycle ergometer exercise is controlled by subjects themselves, by controlling the speed of pedaling; but in treadmill it is controlled by observer, hence yield more reproducible data (1),
- Exercise output can be better quantified with bicycle ergometer exercise (1),
- Breathing is easier in treadmill exercise(11).

V. Conclusion

Therefore when advising exercise for subjects his condition and requirement has to be taken into consideration. Detailed study regarding the same still has scope for research.

References Références Referencias

1. Fortuin NJ, Weiss JL. Exercise stress testing. Circulation 1977 Nov;56(5):699-712.
2. Hermansen L, Ekblom B, Saltin B. Cardiac output during submaximal and maximal treadmill and bicycle exercise. J Appl Physiol 1970 Jul;29(1):82-6.
3. Fletcher GF, Balady GJ, Amsterdam EA, Chaitman B, Eckel R, Fleg J, et al. Exercise standards for testing and training: a statement for healthcare professionals from the American Heart Association. Circulation 2001 Oct 2;104(14):1694-740.
4. Bruce RA. Methods of exercise testing. Step test, bicycle, treadmill, isometrics. Am J Cardiol 1974 May 20;33(6):715-20.
5. Hambrecht RP, Schuler GC, Muth T, Grunze MF, Marburger CT, Niebauer J, et al. Greater diagnostic sensitivity of treadmill versus cycle exercise testing of asymptomatic men with coronary artery disease. Am J Cardiol 1992 Jul 15;70(2):141-6.
6. Lotgering FK, van Doorn MB, Struijk PC, Pool J, Wallenburg HC. Maximal aerobic exercise in pregnant women: heart rate, O2 consumption, CO2 production, and ventilation. J Appl Physiol 1991 Mar;70(3):1016-23.
7. Bhave SY, Pherwani A, Jayakar A, Dattani KK. Comparison of dynamic (treadmill) and static (hand dynamometer) exercise in Indian boys and adolescents. Indian Heart J 1985 Sep;37(5):285-9.
8. Shephard RJ, Allen C, Benade AJ, Davies CT, Di Prampero PE, Hedman R, et al. Standardization of submaximal exercise tests. Bull World Health Organ 1968;38(5):765-75.
9. Venkata Ramana Y Skmsrsabn. Comparison of training loads and physiological responses in athletes: consideration of body weight implications. [3], 134-139. 2012. JEPonline.
10. Koyal SN, Whipp BJ, Huntsman D, Bray GA, Wasserman K. Ventilatory responses to the metabolic acidosis of treadmill and cycle ergometry. J Appl Physiol 1976 Jun;40(6):864-7.
11. Exercise tests in relation to cardiovascular function. Report of a WHO meeting. World Health Organ Tech Rep Ser 1968;388:1-30.

Table 1: Cardiovascular parameters in different types of exercise at resting and immediately after exercises

Variables	Type of Exercise	Rest	After Exercise	Difference	Significance#
Systolic BP mmHg	Bicycle ergometer	109±7.1	127.1±6.5	17.5±4.6	P< .001 HS
	Treadmill	109.9±7.2	144.1±4.0	34.2±6.0	P< .001 HS
	Bicycle Ergometer Vs Treadmill ##		P< .001 HS		
Diastolic BP mmHg	Bicycle Ergometer	71.4±4.6	68.0±6.6	(-)3.4±3.3	P< .001 HS
	Treadmill	71.0±4.6	63.8±7.3	(-)7.2±3.7	P< .001 HS
	Bicycle Ergometer Vs Treadmill ##		P> .001 NS		
Pulse Pressure mmHg	Bicycle Ergometer	38.2±4.3	59.1±6.0	20.9±5.8	P< .001 HS
	Treadmill	39.0±4.7	80.3±7.2	41.3±8.1	P< .001 HS
	Bicycle Ergometer Vs Treadmill ##		P< .001 HS		
Heart Rate BPM	Bicycle Ergometer	73.2±8.1	129.9±9.3	56.7±8.7	P< .001 HS
	Treadmill	72.9±7.6	161.7±14.2	88.8±15.3	P< .001 HS
	Bicycle Ergometer Vs Treadmill ##		P< .001 HS		

Intragroup, Paired t-test
Intergroup, Unpaired t-test

This page is intentionally left blank

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Assessment of the Rational Use of Anti Diabetics in Type 2 Diabetes Mellitus using Case Notes of Patients at a Tertiary Health Care Centre in South West Nigeria

By Omole, Moses Kayode & Chike, Grace Oyidiya
University of Ibadan

Abstract – This study was a prospective study of cases at the University College Hospital, Ibadan. A total of four in-patients comprising of two male and two female adults of the Endocrinology unit were monitored for the study. Patients' case notes and drug administration charts were used to obtain necessary drug information in addition to information obtained directly from the patients. The age group distribution of the patients was found to be between 34-64 years. The mean age was 47.5 years.

Keywords : *Patients, Type 2 Diabetes Mellitus, Endocrinology, Antidiabetics.*

GJMR-B Classification : *NLMC Code: WS 290, WG 166, WB 543*

Strictly as per the compliance and regulations of:

Assessment of the Rational Use of Anti Diabetics in Type 2 Diabetes Mellitus using Case Notes of Patients at a Tertiary Health Care Centre in South West Nigeria

Omole, Moses Kayode[α] & Chike, Grace Oyidiya[α]

Abstract - This study was a prospective study of cases at the University College Hospital, Ibadan. A total of four in-patients comprising of two male and two female adults of the Endocrinology unit were monitored for the study. Patients' case notes and drug administration charts were used to obtain necessary drug information in addition to information obtained directly from the patients. The age group distribution of the patients was found to be between 34-64 years. The mean age was 47.5 years.

The drug regimen showed that Patients A, B, C and D received a total of 8, 10, 11 and 7 drugs respectively. These included Metformin, Insulin, Glibenclamide and Glimepiride as antidiabetic agents. Other drugs prescribed for coexisting diseases included: Nifedipine, Lisinopril, Alpha-methyldopa and Hydrochlorothiazide as Antihypertensives, Atorvastatin as Lipid-Lowering agents and Ceftriaxone, Lxime, Metronidazole, Ciprofloxacin as Antibiotics. Analgesics such as paracetamol and Hematinics such as ferrous sulphate were also prescribed as needed.

Co-morbidities studied include hyperglycemic coma, peripheral neuropathy, Diabetic foot disease, Diabetic ketoacidosis, Hypertension and Hyperlipidemia.

The results were documented and analysed using charts and tables.

Keywords : Patients, Type 2 Diabetes Mellitus, Endocrinology, Antidiabetics.

I. Introduction

The aim of drug therapy for Diabetes mellitus is to reduce morbidity, mortality, control symptoms, delay progression, and improve patients' wellbeing. These can only be achieved with the right drugs and dosages used at the right intervals. It is estimated that more than 50% of all medicines are prescribed, dispensed or sold inappropriately, and that 50% of all patients fail to comply or adhere. The overuse, underuse or misuse of medicines results in wastage of scarce resources and widespread health hazards (WHO, 2003). Rational drug use includes correct prescribing, dispensing and patient adherence. Hence, promoting rational use of drugs requires that the behaviors of all persons involved in each process of prescribing, dispensing and patient use be addressed. (WHO, 1985)

Diabetes mellitus is a metabolic disorder with widespread prevalence. Its actual epidemiology in Africa is unknown because many of the cases are unreported, undiagnosed and untreated. (Aguwa and Omole, 2004). Studies reveal that it affects over 150 million people worldwide. A doubling of this figure is expected in the near future especially in the African and Asian continents due to inadequate research funding and technical expertise. (Ogbera et al, 2007). Its widespread prevalence is due to various factors which include: aging, obesity, sedentary lifestyle, genetic or ethnicity factors and unhealthy diet. Morbidity and mortality of diabetes mellitus are associated with retinopathy, nephropathy, and neuropathy which are complications of diabetes mellitus. However, cardiovascular disease remains the leading cause of death in Type 2 DM. The treatment of risk factors such as obesity, hypertension, and hyperlipidemia is very important in achieving good glycemic control.

The morbidity and mortality rates with Type 2 DM have been found to be very high as shown by reports of several studies conducted in Nigeria. Out of 502 subjects, 20 were previously diagnosed to have Type 2 diabetes mellitus, 14 were diagnosed with diabetes during the study. 34 were, therefore, found to have diabetes, giving a crude prevalence rate of 6.8%. Other cities in Nigeria showed prevalence rates of 1.5% in Ibadan, 6.8% in Port-Harcourt and 3.1% in Jos. The study also revealed the presence of risk factors such as obesity, sedentary lifestyle, alcohol; age, genetics ethnicity, smoking and social class (Nyenwe et al, 2003, Stephen M. Setter 2004). Other studies also reveal that diabetes is a leading cause of blindness, visual impairment, kidney failure and non-traumatic limb amputations. (Khodabandehlou et al, 2004).

The goal of treatment of diabetes mellitus is to control blood glucose and ultimately prevent long-term complications, as shown by the United Kingdom

Author α : Pharm D, B. Pharm, Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan.
E-mail :kayodeomole06@yahoo.com

Prospective Diabetes Study group and Diabetes Control and Complications Trial (British Medical Journal, 1998). The objective of this study is to assess factors that influence the rational use of antidiabetics among in-patients admitted with type 2 diabetes mellitus (DM) at the University College Hospital, Ibadan with the goal of providing and promoting pharmaceutical care.

II. Patients and Methods

A total of four in-patients comprising of two male and two female adults of the Endocrinology unit were randomly selected for the study. Patients' case notes and drug administration charts were used to obtain necessary information.

The patients were randomly selected based on the following inclusion criteria: (1.) Patients diagnosed with Diabetes mellitus Type 2, (2.) Patients between the ages of 18 years and above. (3.) Type 2 diabetes who are on insulin. Patients with type 1 DM were excluded from the study.

Information obtained from the case notes include: medication histories, prescribed dosage regimen, duration of illness, patients' bio-data, chief complaints, co-morbidities (compelling indications), signs and symptoms, physical examinations, laboratory findings as related to the chief complaints, the past medical histories, family and social histories and drug allergies.

The fasting and postprandial blood glucose records were used to assess the patients' glucose level.

Interaction with the patients helped to ascertain their level of knowledge about the disease, their attitude and the extent to which they were involved in the management. The overall results were then discussed.

Ethical approval for this study was obtained along with an online ethical training certificate from UI/UCH ethical committee.

III. Results

a) Patient presentation

Patient was admitted unconscious sequel to high fever, headache, weakness and seizures. He had rashes which receded on application of palm oil. At presentation, his random blood sugar was 264mg/dl and blood pressure was 180/94mm/Hg.

b) physical examination:

Chest: Acidotic breathing, **Respiratory Rate**: 56 cycles/min, **Intranasal Oxygen:** in-situ,**Percussion Node:** resonant, **Breast sounds:** widespread transmitted sounds

Cns: Unconscious, Neck is supple, slowly reactive to light

Reflexes: normal. **Cvs: Pulse:** 98 beats/min, normal volume, regular, No arterial wall thickening, **Heart Sounds:** 1 and 2 only, **Bp:** 180/94mmHg. **Abdomen:** Flat, moves with respiration, Soft,Liver span 10cm, No ascites.

Medical History: Patient has been diabetic for 3 years, Not regular on medications **Family History:** Monogamous family, has one child, Parents had Type 2 DM and hypertension. **Social History:** Not a smoker nor alcoholic

Past Medication History: Metformin and Glibenclamide. Dosage regimen – not stated

Laboratory Tests And Results: Pcv 38%,Na^+ 146, K^+ 3.2, **Urea** 27mg/dl, HCO_3^- 18mmol/L. **Urinalysis: Glucose** +++,**Ketone** ++,**Protein** +,**pH** 5.0. **Other Investigations:** UrineM/C/S, Cranial CT scan

Assessment: Viral Encephalitis, Background Diabetes mellitus with Hyperglycemia, Aspiration pneumonitis, Hypertension.

Therapeutic Plan: Continue intranasal oxygen delivery 4-5L/min, Monitor RPG 5-hourly, IV ceftriaxone 1g 12-hourly, IV normal saline 0.9% 1L 6-hourly, IV 20% Mannitol 250ml 8-hourly for 48 hours, G: K: I 5: 5: 5 at 100ml/hour, Run neurological and viral studies, Monitor blood pressure.

08/07/11: Plan: Commence oral hypoglycemic agents, Monitor RPG, Monitor BP, Tab. Metformin 500mg 12-hourly, Tab. ASA 75mg daily, Diabetic diet 200kCal/day.

09/07/11: FPG: 204mg/dl, BP: 130/90mm/Hg. **Plan:** Continue with current treatment.

Tab. Lisinopril 7.5mg daily **13/07/11:**RPG: 153mg/dl, BP: 140/70mm/Hg Patient feels well and in improved state of health.

Case 2 (Patient B)

Patient Biodata: Age: 64, **Religion**: Christianity, **Tribe**: Yoruba, **Sex**: Female
Occupation: Trader, **Marital Status**: Married.

Patient Presentation: A 64-year old woman, diagnosed with Type 2 diabetes mellitus 15 years ago. She presented on 12th of July, 2011 with pain under both feet noticed 8 years ago. She also presented with vaginal itching, nocturia, frothy urine, sweating, high grade fever with intermittent chills and rigors, blurred vision and foot ulcer secondary to injury sustained after stepping on broken glass. She was already undergoing management for hyperlipidaemia. She weighed 157kg with a height of 161cm. Her Random Plasma Glucose on presentation was 370mg/dl.

Physical Examination:- On Observation: Patient was not pale, no digital clubbing, was cyanosed, no pedal swelling or peripheral lymph node enlargement. Right foot showed hyperpigmentation, swelling with abcess collection on plantar surface of the foot. **Chest: Respiratory Rate:** 20 beats/min, **Trachea:** central, **Breast Sounds:** Vesicular, **Percussion Node:** resonant. **Abdomen:** Full, moves with respiration, Obese, No areas of tenderness, Liver^0 Spleen^0 Kidney^0, Ascites^0,

Appendectomy scar observed **Cns:** Conscious, alert, oriented in time, place and person, Power reflexes, normal. No signs of meningeal irritation, Pupils 3mm bilaterally, reactive to light **Sensation:** Vibration sensation impaired in both lower limbs. **Breast:** No skin discharge, No palpable masses, No areas of tenderness, No nipple discharge. **Cvs: Pulse:** 98/min, regular, Thickened arterial wall, **Bp:** 144/70 mmHg, **Heart Sounds** 1 and 2 only.**Vaginal Examination:**Atrophic external genitalia, Circumferential area of excoriation around the vagina, No masses or ulcer seen, Cervix closed, Gloved finger stained with discharge. **Rectal Examination:**Rectum filled with soft feces, No palpable masses, Gloved finger stained with yellow stool.

Medical History: Diabetes for 15 years, Frothy urine for 3 years, Patient gradually losing both eyes, has had an appendectomy.

Family/Social History: Mother Diabetic, Husband is diabetic, no alcohol, not smoking.

Past Medication History: Oral hypoglycemic agents (metformin and chlorpropamide) but not regular on medications. Takes herbal medications (bitterleaf and oranges)

Assessment: Grade III diabetic foot, Diabetes mellitus Type 2, Present risk factors of family history and obesity. Diabetes mellitus complications with peripheral vascular disease, autonomic neuropathy and senile cataract.

Laboratory Tests And Results:Na = 142 mmol/L, **K** = 2.9 mmol/L, **HCO3** = 23mmol/L, **Urea** = 63mg/dL , **HDL**= 33mg/dL ,**LDL**= 172mg/Dl, **Creatinine**=1.5mg/dL, **Total cholesterol**=215mg/dL, **PCV** = 32%, **Bilirubin** = negative, **Ketone** = negative, **Nitrite** = negative, **Glucose** = positive , **Leucocycte** = negative, **Protein** = positive, **Blood** = positive, **pH** = 6.0, **SG**=1.025, **I/O**= 600mls (oral) + 300mls (intravenous infusions)/ 650mls urine.

Therapeutic Plan: Foot X-RAY, HbA1C, Wound biopsy, ECG/ECHO Sc. Soluble Insulin 4IU 30mins before breakfast, lunch and dinner, Sc. Soluble NPH 4IU at bedtime, Sc. Anti-tetanus toxoid 1500IU after test dose, IV ceftriaxone 1g 12-hourly, IV Flagyl 500mg 8-hourly, Tab. Vitamin C 200mg 8-hourly, Tab. PCM 1000mg 8-hourly, Fluid input and output monitoring, Ophthalmology review, Elevate right lower limb, Carry out pus aspirate test

Case 3 (Patient C)

Patient Biodata: Age: 48, **Religion**: Christianity, **Sex**: Male, **Occupation**: civil servant (Soldier), **Marital Status**: Married, **Tribe**: Efik, **Date of admission**: 28/06/11.

Patient Presentation: Patient presented unconscious sequel to headache, fever, chills and rigor. He was reported to be in a normal state of health until he developed abdominal pain which was worse over the supra-pubic region and radiating to the waist. The pain was colicky in nature, waxing and waning with no known aggravation or relieving factor. The patient was vomiting and the vomitus contained recently ingested food and bilous substances.He was referred from the Military Hospital to UCH for expert care. He lost consciousness on the way to UCH. There was no reliable history of Polyphagia and Polydipsia. Patient had polyuria. Random plasma glucose at presentation was 600mg/dl.

Physical Examination: Poorly kempt middle-aged man, not pale, no pedal oedema nor fingernail clubbing. **Abdomen:** Nasogastric tube in-situ, draining coffee-brown substance, Flat, moves with respiration, Mild epigastric and suprapubic tenderness, Liver^0 Spleen^0 Kidney^0, No ascites, Hypoactive Bowel sounds **CNS:** Conscious, drowsy, oriented in time, place and person, Neck is supple, motor system normal, Pupils reactive to light. **Chest: Respiratory** rate 24 cycles/min, **Trachea:** central, **Percussion node**: resonance, **Breast sounds**: vesicular, Equal chest expansion bilaterally. **CVS: Pulse:** 130 beats/min, normal volume, regular, No arterial wall thickening, **Heart sounds**: 1 and 2 only, **BP:** 120/74mm/Hg

Medical history: Type 2 diabetes mellitus diagnosed 2 years ago, No family history of hypertension. **Social History:** Patient smokes 5-10 sticks of cigarette for about 15 years, **Past medication History**: Not documented.

Assessment: Hyperglycemic state in a known diabetic, Hyperglycemic hyperosmolar state precipitated by sepsis (likely urinary tract infection), Intestinal obstruction, Stress-induced gastritis

Laboratory Tests And Results: Na^+ 138,K^+ 4.9, **Urea** 27mg/dl HCO_3^- 23mmol/L, **Glucose** +,**Ketone** +, **Urobilinogen** +, **Bilirubin** negative **Protein** negative, Leucocyte, **Nitrogen** negative, **Weight** 55kg **Height** 1.75m, **BMI** 18kg/m2

Therapeutic Plan: Deep IM soluble Insulin 10IU stat, IV soluble Insulin 10IU stat, IVF 0.9% Normal saline 1L 4-hourly, IV Metronidazole 500mg 8-hourly, IV Ciprofloxacin 200mg 12-hourly.

Invite general surgeons to review on account of intestinal obstruction features observed.

28/06/11: Patient complains of epigastric pain. He is given:, IV Omeprazole 40mg daily for 3days

30/06/11: Patient is started on oral dosage forms of Omeprazole, Ciprofloxacin, Metformin, Glibenclamide and antihypertensives.

06/07/11: Patient refuses to accept insulin. Requests to be discharged against medical advice, Social workers invited to counsel patient.

10/07/11: HbA1C investigations were hindered by financial constraints of patient.

11/07/11: Patients insists on discharge. Patient signs The Discharge against Medical Advice Form

Case 4 (Patient D)

Patient Biodata: Age: 44 years,**Religion:** Islam,**Tribe:** Yoruba, **Sex:** Female

Marital Status: Married, **Date of Admission:** 15/07/11

Patient Presentation: Patient recently had a new baby. She had Nocturia (4-5 times at night), dizziness and headache earlier in pregnancy. She complained of muscle cramps in both legs, occasional numbness, frothy urine and blurred vision. She was diagnosed with Hypertension in the 3rd trimester of pregnancy and was referred from a private hospital to the University College Hospital on account of a deranged glucose profile of FPG 387mg/dl and RPG of 551mg/dl.

Physical Examination: Patient is obese, not pale. She is mildly dehydrated and has pedal oedema up to the ankles bilaterally. **Weight** 92kg, **Height** 155.4cm, **BMI** 38.1kg/m2, **Waist** 118cm, Hip 110cm **CVS:** Pulse 120/min, Thickened arterial wall, **BP**: 160/90mmHg, Jugular Vein Pressure technically difficult to check.

Heart Sounds: 1 and 2 only **Chest: Respiratory rate**: 20 cycles/min, Trachea central, Vesicular breast sounds

Abdomen: Obese, soft, Surgical scar noted midline infraumbilically, No areas of tenderness, Liver^0 Spleen^0 Kidney^0, Liver span 11cm **CNS:** Conscious, alert, Power and reflexes normal, Sensation normal to light touch, vibration and pain. **Past medical history:** Hypertension, DM 2, Had ectopic pregnancy and surgery in 2002

History of infertility for 16 years. Had a baby 3 weeks prior to admission.

Assessment: Hyperglycemic state in newly diagnosed Diabetes mellitus Type 2.
Systemic hypertension. Stage 2 obesity.

Laboratory Tests And Results: Na^+ 131, K^+ 4.4,**Urea** 18mg/dl
HCO_3^- 20mmol/L, **Creatinine** 0.8mg/dl, **Cl** 103mEq/L

Urinalysis :Nitrogen +,Protein +,Glucose +,Ketone –,Bilirubin –, Blood – , pH 5.0 PCV 42%

Therapeutic Plan: Commence Pre-mixed insulin 20IU in the morning, Premixed insulin 20IU in the evening, IV Normal saline 1L 6-hourly for 24 hours, Diet at 2000kCal/day, Tab. Nifedipine 20mg 12-hourly, Tab. Lisinopril 5mg dailyInvite health educators to counsel patient, Strict plasma glucose and blood pressure monitoring.

IV. Discussion

The purpose of anti-diabetic therapy is to reduce morbidity, mortality and to improve patient's wellbeing. It involves taking measures that result in adequate control of plasma glucose while taking into consideration co-morbid conditions and individual needs of patients such as financial constraints, gender and age (Enovare et al 2006, Priscilla et al, 2010). In this study, the patients were admitted on account of deranged blood glucose levels precipitated by stress, infections and non-compliance with prescribed therapy.

The connection between infections and hyperglycemia follows a vicious cycle in which hyperglycemia increases susceptibility to infections which deteriorates metabolic conditions within the body leading to difficulty in control of hyperglycemia (Rang, 2008). This is evident in the fluctuations which occurred during Insulin therapy. Patients A and C (Tables 1&3). Patients C and D (Tables 3&4) had low response to Insulin even on addition of Oral Hypoglycemic Agents (OHAs) to their insulin therapy. For patient D (table 4), there was no established microbial infection therefore; the poor response might have been due to presence of risk factors such as hyperlipidemia, obesity with Body Mass Index (BMI) values being 38.1kg/m^2 and uncontrolled hypertension.

Blood pressure goals are generally more difficult to achieve in diabetic patients especially in the presence of risk factors such as obesity which aggravate the metabolic syndrome (Diabetic control and complication trial 1998). Other factors that result in suboptimal glycemic control include hypersecretion of glucagon, presence of insulin antibodies, poor absorption at injection site and physical inactivity which impairs insulin absorption (American Diabetes Association 2003, 2004).

Patient B (Table 2) responded positively to insulin therapy. This underscores the fact that no two diabetics are the same and there is need for individualized treatment. Patient A (Table 1) was administered Glucose:Potassium:Insulin in order to restore potassium ion balance. The combination is useful because hypokalemia could lead to cardiac arrhythmias. (Rang et al, 2008). Potassium was given with insulin and glucose in order to maintain intracellular concentration of potassium (The National high blood pressure working group 1994, Strev C.T et al 1998)

During insulin therapy, patient A tended towards hypoglycemia, hence, the dosage was reduced. For the four patients, there were no adverse reactions documented during insulin therapy.

The four patients were administered Metformin, a biguanide which is known to consistently reduce fasting plasma glucose levels significantly. It also provides the advantage of modest weight reduction and an inhibitory effect on glucagon, an antagonist of insulin. (Curtis et al, 2005).

The results of the United Kingdom Prospective Diabetes Study reveals that Biguanides and Sulphonylureas are useful as first and second-line therapy alone or in combination with added advantages of cost and efficacy.

Patients A, B and C (Tables 1,2 &3) were discharged with prescriptions of these combination drugs while patient D (Table 4) was discharged on insulin and Metformin alone. No adverse reactions or contraindications were encountered.

Risk factor reduction focuses on management of co-morbidities such as hyperlipidemia. (Omole and Bello, 2011) in order to reduce morbidity and mortality associated with DM. Patient B (Table 2) was placed on lipid-lowering therapy with Atorvastatin and this seemed appropriate due to her high total cholesterol and obesity (Erickson J. et al 1995)

In the management of hypertensive Type 2 DM patients, Angiotensin Converting Enzyme Inhibitors (ACEIs) and Angiotensin II Receptor Blockers (ARBs) are generally recommended as drugs of choice (Standard treatment guideline for Nigeria 2008). This is due to their well-documented reno-protective effects. (Curtis et al, 2005.) The four patients were prescribed Lisinopril. The America Diabetic Association (ADA), and the 7th report of the Joint National Committee for Evaluation, Prevention and Treatment of Hypertension (JNC VII) recommend currently, the use of any class of antihypertensives as long as they show benefits in prevention of poor cardiovascular outcomes and show no contraindications or poor tolerance. It seems appropriate that patient C (table 3) was prescribed a combination of Lisinopril and Nifedipine while Patient D (table 4) was prescribed Lisinopril, Alpha-methyldopa and hydrochlorothiazide. These combinations yielded better results as patients were monitored to prevent electrolyte imbalance and other adverse effects(UK Prospective Diabetic Study Group 1998)

The metabolic syndrome is associated with a clustering of cardiovascular risk factors including coagulation abnormalities. (Reaven, 1988) which necessitates the use of low-dose Aspirin at 75mg daily. It is recommended especially in patients who have a history of macrovascular disease, coronary heart disease, hypertension, cigarette smoking, hyperlipidemia and obesity.

Only patient A (Table 1) was prescribed Aspirin. It is likely that it was contraindicated in the other patients. Patient C had severe epigastric pain for which chronic use of low-dose Aspirin was contraindicated. The pain was managed with Omeprazole. In patients B and D, it is likely that Aspirin was simply omitted.

The control and prevention of microbial infections has been found to have significant positive effects on glycemic control (British Medical Journal, 2010). The four patients A, B, C & D (Tables 1, 2 ,3 & 4) received antibiotic therapy which was aimed at treatment of existing microbial infections and prophylaxis of Hospital-acquired sepsis. Ceftriaxone, Metronidazole, Ciprofloxacin and Ixime were prescribed. They act against Gram positive and Gram negative micro-organisms as well as protozoal and anerobic organisms. Anti-tetanus toxoid was administered to patient B (Table 2) to prevent sepsis of her foot ulcer. Analgesics were also administered as needed to the patients.

The patients received non-pharmacologic therapy as an adjunct to pharmacotherapy. The patients also benefited from our (Clinical Pharmacists) educating them on hygiene, diet and lifestyle modifications as well as attitude to disease.

Patients A, B and D (Tables 1, 2 & 4) were discharged accordingly except Patient C (Table 3) who began to refuse treatment during his admission period. He asked to be discharged against medical advice. This presented another factor militating against rational management of disease conditions. Rational use of drugs depends not only on members of the healthcare team but also on the patient who is required to cooperate with healthcare providers in order to achieve success in therapy.

V. Conclusion

This study has shown that rational use of medicines lies with the patient as well as healthcare providers. It also revealed problems militating against the rational use of medications. These include: drug availability, financial constraints, socio-cultural backgrounds of patients, co-morbidities, age, gender, drug allergies and personal preferences. The roles of Clinical Pharmacists in counseling and monitoring the diabetic patient during drug dispensation cannot be underestimated as these roles helps in the provision and promotion of pharmaceutical care.

VI. Acknowledgement

We acknowledge the cooperation of the members of staff of the endocrinology department of University College Hospital (UCH) Ibadan, Nigeria.

References Références Referencias

1. Aguwa C.N. and Omole M.K.(2004); Diabetes mellitus in: Therapeutic Basis of Clinical Pharmacy in the Tropics. 3rd Edition, pp. 302-330.
2. American Diabetes Association (2003).http://www.diabetes.org/diabetes-statistics/cost-ofdiabetes-in-us.js
3. American Diabetes Association; (2004); Screening for Type 2 Diabetes. Diabetes care 2004; Vol. 27:133.
4. British Medical Association and Royal Pharmaceutical Society of Great Britain; (2003); British National Formulary (BNF), 46th edition, pharmaceutical Press (Pub), U.K. pp. 62-69, 123-129, 326-341.

5. Cutis L. T., Charles A., Reasner W., Isley L., (2005); Pharmacotherapy: A Pathophysiologic Approach; in: Endocrine Disorders; Diabetes Mellitus. 6th Edition; Mac Graw Hill Companies, U.S.A. pp: 1333-1364
6. Diabetes Control and Complications Trials Research Group (1998); The Effects of Intensive Treatment on the Development and Progression of Long-Term Complications in Insulin-Dependent Diabetes Mellitus. England Journal of Medicine; 329: 977-986; 1993.
7. Enwere O.O., Salako B.L. and Falade .C.O., (2006); Prescription and Cost Consideration at a Diabetic Clinic in Ibadan, Nigeria: A Report; Annals Of Ibadan Postgraduate Medicine. Vol.4 No2 pp.35-38.
8. Eriksson J, Fransilla-Kallunki A, Ekstrand A, et al. (1995); Early Metabolic Defects in Persons at Increased Risk of Non-Insulin Dependent Diabetes Mellitus. N. Engl Med. 321:690–698.
9. Khodabandehlou T., Le Derehat C. (2004); Hemorhological Disturbances as Markers of Diabetic Foot Syndrome Deterioration. Clin. Hemorrheol Microcirc. 30: 3-4.
10. Nyenwe et al (2003); Type 2 Diabetes in Adult Nigerians: A Study Of Its Prevalence and Risk Factors in Port-Harcourt, Nigeria in: Diabetes Research and Clinical Practice 62 (2003): 177-185.
11. Omole M.K., Bello E., (2011); Assessment With Case Studies the Rational Use of Drugs Among Patients With Ischaemic Heart Disease at a Tertiary Hospital In Southwest Nigeria; In : Journal of Pharmaceutical and Medical Sciences; 1 (5): 108-112.
12. Priscilla A.H., Pamela K.; (2010); Type 2 Diabetes Comorbidities and Treatment Challenges: Rationale for DPP-4 Inhibitors; Postgraduate Medicine vol. 122, pp. 78.
13. Reaven G.M. (1998); Role of Insulin Resistance in Human Disease. Diabetes; 1998; Vol. 37: 1595-1607.
14. Standard Treatment Guidelines for Nigeria (2008); Endocrine System; pp. 90-96.
15. Stephen M. Setter, John R. White, Jr. and R. Keith Campbell (2000): Textbook of Therapeutics : Drug and Disease Management, 8th Edition; Philadelphia, Pensylvania, USA: Lippincott, Williams and Wilkins ; pp. 1043-1075.
16. Strev C.T., Chander P.N., Rocha R, Zuckerman A.; (1998); Non-epithelial Effects of Aldosterone. Current Opinion in Endocrinology and Diabetes Vol. 5: 211-216.
17. The National High Blood Pressure Education Programme Working Group (1994); Report on diabetes.Hypertension 1994; 23:145–58.
18. U.K. Prospective Diabetes Study (UKPDS) Group, (1998); Tight Blood Pressure Control And Risk Of Macrovascular And Microvascular Complications In Type 2 Diabetes (UKPDS 38). British medical journal 317:703-713.
19. U.K. Prospective Diabetes Study Group (1998); Effect of Intensive Blood-Glucose Control with Metformin on Complications in Overweight Patients with Type 2 Diabetes (UKPDS 34). Lancet.352:854–865.
20. U.K. Prospective Diabetes Study Group (1998); Intensive Blood Glucose Control with Sulphonylureas or Insulin Compared with Conventional Treatment and Risk of Complications in Patients with Type 2 Diabetes (UKPDS 33). Lancet. 352:837–853.
21. U.K. Prospective Diabetes Study Group (1998); Tight Blood Pressure Control and Risk of Macrovascular and Microvascular Complications in Type 2 Diabetes (UKPDS 38). Br Med J. 317:703–713.
22. WHO (1985); Rational Use of Drugs. Report of the Conference of Experts, Nairobi, Kenya. November 25-29. World Health Organisation, Geneva. pp. 92-94.
23. WHO (1999); Definition, Diagnosis and Classification of Diabetes mellitus and its Complications. Report of a WHO consultation: Part 1: Diagnosis and Classification of Diabetes mellitus; Geneva, WHO; 1999.
24. WHO (2003); Promoting the Rational use of Drugs in: Drugs and Therapeutics committees-A Practical Guide. pp. 95-104.
25. www.diadetes.org./diabetes-statistics; Diabetes Facts and Figures. Accessed August 21, 2011.
26. www.wikipedia.com/type2diabetesmellitus. Accessed August 21, 2011.
27. www.sizlopedia.com/ diabetesmellitus. Accessed August 21, 2011.

Table 1: Insulin dosing and corresponding BP and plasma glucose levels for Patient

Date	Insulin Dosage G: K: I	RPG (mg/dl) before insulin administration	BP (mm/Hg)	Remark
At presentation	-	264	180/94	
01/07/11	5: 5: 5	252		Patient responding
04/07/11	5: 5: 25	156		Patient hypoglycemic?
06/07/11 at 8.00 a.m.	5: 5: 10	172		Insulin dosage reduced
06/07/11 at 11 p.m.	5: 5: 15	259		Poor control
07/07/11		142	120/70	Good response. Patient is alert

Table 1B : Drugs Prescribed On Discharge of Patient A

/N	Name of Drug	Class of Drug	Dosage Regimen
1	Metformin	Biguamide	Tab. 500mg 12-hourly
2	Glibenclamide	Sulforyl urea	Tab. 5mg daily
3	Lisinopril	ACEI- Antihypertensive	Tab. 10mg daily
4	ASA	Anti-platelet	Tab. 75mg daily

Table 2 : Insulin dosing and corresponding BP and plasma glucose levels for Patient B

Date	Insulin dosage	FPG mg/dl	BP mm/Hg	Remarks
12/07/11	Sc. Soluble Insulin 4IU 30mins before breakfast, lunch and dinner Sc. Soluble NPH 4IU at bedtime	370	144/70	
13/07/11	Sc. Soluble Insulin 4IU 30mins pre-breakfast, lunch and dinner. Sc. Soluble NPH 4IU at bedtime.	235	130/90	Ceftriaxone not available
14/07/11	Sc. Soluble Insulin 4IU 30mins before breakfast, lunch and dinner Sc. Soluble NPH 4IU at bedtime	222	180/90	Poor glycemic control with elevated BP
16/07/11	Sc. Soluble NPH 8IU at bedtime	135	120/70	Improved

Table 2B : Drugs Prescribed On Discharge of Patient B

S/N	Name of Drug	Class of Drug	Dosage Regimen
1	Candesartan	Neurologic analgesic	Tab. 16mg daily
2	Atorvastatin	Anti-hyperlipidemis	Tab. 20mg daily
3	Metformin	Biguanide	Tab. 500mg 8-hourly
4	Glibenclamide	Sulforyl urea	Tab. 5mg daily

Table 3A: Insulin dosing and corresponding BP and plasma glucose levels for Patient C

Date	Insulin dosage	RPG mg/dl	FPG mg/dl	BP mm/Hg	Remarks
28/06/11(at presentation in the morning)	IV Insulin 10IU stat. Deep IM Insulin 10IU stat	600		120/74	First dosage
28/06/11 (evening)	Deep IM Insulin 10IU 2-hourly	406		140/90	Patient conscious. Complains of epigastric pain which worsens after food.
29/06/11 (1.30 a.m.)	Deep IM Insulin 8IU 2-hourly	331			Gradual decrease.
29/06/11 (8.00a.m.)	Deep IM Insulin 8IU 2-hourly	287		160/110	
29/06/11 (2.00p.m.)	Deep IM Insulin 8IU 2-hourly	339			Poor control, gradual derangement
29/06/11 (6.50p.m.)	Deep IM Insulin 8IU 2-hourly	291			
30/06/11 (12.30a.m.)	Deep IM Insulin 8IU 2-hourly	149		160/90	RPG now normal. Patient feels better.
30/06/11 (9.00a.m.)	Deep IM Insulin 8IU 2-hourly	310			
30/06/11 (6.00p.m.)	Deep IM soluble Insulin 8IU 2-hourly Sc. Soluble Insulin 8IU 8-hourly pre- meals	359		160/120	
01/07/11	Deep IM soluble Insulin 8IU pre-meal and 14IU bedtime		150/100	293	
05/07/11			130/110	120	
06/07/11			130/110	251	Patient started on oral hypoglycemic agents
07/07/11 (8.30 a.m.)	OHA+insulin		110/70	157	
07/07/11 (11.30a.m.)	OHA+insulin	238	100/90		
08/07/11 (8.00a.m.)	OHA+insulin		110/90	307	
10/07/11 (8.00a.m.)	OHA+insulin			362	
10/07/11 (11.30a.m.)	OHA+insulin	465			
11/07/11 (08.00a.m.)	OHA+insulin			369	Bedtime insulin was missed
11/07/11 (10.00a.m.)		247			Patient asks to be discharged.

Table 3B: Drugs Prescribed On Discharge of Patient C

S/N	Name of Drug	Class of Drug	Dosage Regimen
1	Ciprofloxacin	Antibiotics	Tab. 500mg 12-hourly
2	Nifedipine	Calcium Bloke Anti-hypertensive	Tab. 20mg daily
3	Lisinopril	ACEI-Antihypertensive	Tab. 5mg daily
4	Metformin	Beguamide	Tab. 500mg 12-hourly
5	Glibenclamide	Sulforyl urea	Tab. 10mgdaily(30 minutes before breakfast)
6	Fesolate	Hematinic	Tab. 200mg 8-hourly
7	Metronidazole	Anti-bacterial	Tab. 400mg 8-hourly
8	Moduretic	Thiazide and Potassium sparing anti-hypertensives	Tab. ½ tab. daily.

Table 4: Insulin dosing and corresponding BP and plasma glucose levels for Patient D

Date	Regimen	RPG mg/dl	FPG mg/dl	BP mm/Hg
15/07/10(9.00a.m.)	Metformin 1g + Glibenclamide 10mg	551	387	160/90
15/07/10 (6.00pm)	Premixed insulin 20IU morning, 20IU evening	331		112/70
15/07/10 (10.00p.m.)	Glimepiride 2mg 30mins Pre-breakfast. Metformin 500mg 8-hourly. NPH 10IU at bedtime	275		
16/07/11	Glimepiride 2mg 30mins pre-breakfast Metformin 500mg 8-hourly NPH 10IU at bedtime	369		160/100
17/07/11	Glimepiride 2mg 30mins pre-breakfast Metformin 500mg 8-hourly NPH 10IU at bedtime		327	
18/07/11	Insulin Sc. Mixtard 28IU morning, 22IU evening 30 mins before meals. OHAs		229	130/70
19/07/11	Insulin Sc. Mixtard 28IU in the morning, 22IU in the evening 30 mins before meals. OHAs		287	110/80
20/07/11	Basal bolus Insulin 5IU 8-hourly. Bedtime Sc. NPH 15IU Metformin 1g 12-hourly.		238	132/88
21/07/11 (8.00a.m.)			238	110/70
21/07/11 (11.00a.m.)	Basal bolus Insulin 8IU 8-hourly. Bedtime Sc. NPH 18IU. Metformin 1g 12-hourly.	352		

Table 4 : Drugs Prescribed On Discharge of Patient D

S/N	Name of Drug	Class of Drug	Dosage Regimen
1	Sc. Soluble Insulin	Parental Anti-diabetic	Susp. 8IU Pre- breakfast
2	Sc. Soluble Insulin	Parental Anti-diabetic	Susp. 8IU Pre-lunch
3	Sc. Soluble Insulin	Parental Anti-diabetic	Susp. 8IU Pre-dinner
4	Sc. NPH Insulin	Parental Anti-diabetic	Susp. 18IU at bedtime
5	Aldomet	Central acting Anti-hypertensive	Tab. 500mg 12-hourly
6	Hydrochlorothiazide	Thiazide Anti-hypertensive	Tab. 12.5mg daily
7	Ixime	Anti-biotic	Tab. 400mg daily x5days
8	Lisinopril	Angiotensin Converting Inhibitor(ACEI) Anti-hypertensives	Tab. 5mg 12-hourly
9	Astyfer	Hematinic	Cap. I capsule 12-hourly
10	Gestid	Non-systemic antacid	Susp. 15mls 8-hourly

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Drug Addiction and Rehabilitation in Nigeria: Insights from Sociological Theories

By Dr. Faloore O. Olutola
Redeemers Univeristy, Mowe, Ogun State, Nigeria

Abstract – In recent times, discourse on drug abuse and addiction has taken an upward trend globally; and this might not be unconnected with the phenomenal increase in the rate of drug dependence and its associated problems. As a matter of fact in recent years, the problem of drug abuse and addiction has received a considerable attention especially among Governments, Non Governmental Organizations, International Agencies, Health Workers, Academics and Researchers just to mention few. More recent scholarship has shown that studies on drug abuse and addiction have yielded important insights into both the causes and consequences of drug dependence. Often, the works in the addiction field usually use the pharmacological/medical model, psychological theories of behavior, or operate within the confines of a criminal justice perspective. Perusal of literature has shown that contributions from the field of sociology are not only scarce but also limited to the use of methods of sociological Investigations.

Keywords : *Drug abuse, drug addiction, drug dependence, Treatment, Rehabilitation, Reintegration.*

GJMR-K Classification : *NLMC Code : QV 38*

Strictly as per the compliance and regulations of:

Drug Addiction and Rehabilitation in Nigeria: Insights from Sociological Theories

Dr. Faloore O. Olutola

Abstract - In recent times, discourse on drug abuse and addiction has taken an upward trend globally; and this might not be unconnected with the phenomenal increase in the rate of drug dependence and its associated problems. As a matter of fact in recent years, the problem of drug abuse and addiction has received a considerable attention especially among Governments, Non Governmental Organizations, International Agencies, Health Workers, Academics and Researchers just to mention few. More recent scholarship has shown that studies on drug abuse and addiction have yielded important insights into both the causes and consequences of drug dependence. Often, the works in the addiction field usually use the pharmacological/medical model, psychological theories of behavior, or operate within the confines of a criminal justice perspective. Perusal of literature has shown that contributions from the field of sociology are not only scarce but also limited to the use of methods of sociological Investigations. However, this explains reasons many people are yet to term with reality about sociological understanding and explanations of drug dependence. Building on this premise, this work's purpose is to review relevant sociological theories as discussed in the literature, identify their appropriateness to the understanding of drug abuse and dependence.

Keywords : Drug abuse, drug addiction, drug dependence, Treatment, Rehabilitation, Reintegration.

I. Introduction

Drug abuse and addiction has attracted considerably scholarly attention all over the world. In the past three decades or more, drug dependence in its various forms and contexts has emerged as one of the most salient discourse in social sciences. Evidently, the issue of drug abuse and addiction has become one of the various social problems whose consequences are seen with increasing frequency by caregivers, family members and the broad spectrum of people around the globe. It is no longer news however, that the incidence of drug abuse and addiction is becoming alarming in recent times in most societies, especially in Western Europe where, drug use, abuse and trafficking are rated as the most urgent social problems. As revealed by social research findings and depicted in literature, drug abuse is a social problem that has spread and increased rapidly in recent decades across diverse segments of countries of the world, constituting a threat to the effective functioning and survival of the society (Parul, 2007; World Drug Report, 2010).

Worldwide, drug abuse and addiction has become a crucial issue that stakeholders-governments, drug addicts, drug addicts' relations, health care practitioners and Non-governmental Organizations frequently ask questions about; and, which in contemporary debate is yet to attract sufficient information as far as causes and effective rehabilitation and reintegration of the problem are concerned. As a cautionary note at this juncture, the fact that issue of drug dependence has generated much questions of which a larger percentage are yet to be answered does not translate to mean that there is a dearth of research works in the area. As a matter of fact, however, works in the area of drug dependence in recent times has grown in leap and bounds.

As evident in literature and research, the use of drugs is frequent especially among vulnerable young people and dependence on drugs has caused a significant burden on individuals and societies throughout the world. The World Health Report 2002 indicated that 8.9% of the total burden of disease comes from the use of psychoactive substances. The report showed that tobacco accounted for 4.1%, alcohol 4%, and illicit drugs 0.8% of the burden of disease in 2000. Much of the burden attributable to substance use and dependence is the result of a wide variety of health and social problems, including HIV/AIDS, which is driven in many countries by injecting drug use.

Research findings have established that people abuse substances such as drugs, alcohol, and tobacco for varied and complicated reasons and the specific drug (or drugs) used varies from country to country and from region to region. Worldwide, the five main drugs of use are Cannabinoids, Stimulants, Hallucinogens and other compounds, Opiods and Morphine Derivatives and Depressant. Studies have shown that effects of drug addiction manifest physically, physiologically, and socially through the behaviour of drug addicts in society (NIDA, 2008). It is important to note that dependence on psychoactive substances is widely prevalent, cutting across age, class and gender, but it is difficult to estimate the number of drug addicts or formulate a comprehensive approach to deal with the problem primarily because it involves a "hidden population" that does not seek treatment. Hence, it is difficult to assess the problem, estimate its costs (social and economic), and design reliable intervention strategies for it (Mandira, 2005; Makanjuola, 2007; NIDA, 2008).

In the case of Nigeria, Substance abuse and addiction is becoming increasingly widespread and a substantial percentage of the national budgetary health allocation is utilized for treatment and rehabilitation of people with substance use problems (CASSAD, 1998; Adelekan M.L. 1999; UNDCP, 2000, Makanjuola, Daramola and Obembe, 2007). The various reports of rapid situation assessments of drug abuse and addiction in the country show a picture of widespread consumption of cannabis (10.8%), followed by psychotropic substances (mainly the benzodiapines and amphetamine-type stimulants) 10.6% and to a lesser extent heroin (1.6%) and cocaine (1.4%) in both the urban and rural areas. The use of volatile organic solvents (.053%) is reported to be becoming popular, especially among the street children, in-school youth and women (NDLEA/UNDCP, 1999). Thus, concerns for the control of drug abuse and addiction have become a major issue.

As a part of efforts to alleviate the several adverse consequences of use and dependence on illicit drugs in societies in Nigeria, governments at various times have allocated substantial public resources for drug treatment, and also formulated policies to contain the spread of drug use among various segments of non-users of illicit drugs (UNODC, 2010). To achieve effective functioning of drug dependants in the home, workplaces and society in general, drug treatment services are offered through a variety of modalities such as residential and outpatient approach, traditional treatment among herbalists, diviners, and criminal justice system. However, available information on drug abuser and addicts in Nigeria shows that treatment has not been left alone for the government. Over the past few decades some non-governmental organizations have responded with comprehensive strategies to treat and rehabilitate drug-addicts through a multi-disciplinary approach involving preventive education through awareness-creation activities, research, training, treatment, rehabilitation and social reintegration.

So, in line with the argument above, this work examines a number of sociological theories that explain causation of drug abuse and addiction and also addresses how well a treatment programme can meet individuals and social needs.

II. Theoretical Explanations of Drug Addiction and Rehabilitation of Addicts

Theories adopted in this paper are sociological theories that are relevant to explanation of causation of drug abuse and addiction as well as rehabilitation of drug addicts. This is germane in this study because sociology unlike physics, medicine, or economics, which operate within fairly well-established and generally accepted overarching theoretical perspectives, does not yet have such an all-encompassing theoretical framework that can guide investigations. However, the sociological theories adopted in this study take a more micro-level orientation to drug use and rehabilitation of drug addicts in the society.

The issues of drug rehabilitation and social reintegration have been greatly revived over the past decades. This issue is one that continues to excite controversy and debate at academic, public and other several levels. Globally, findings from social research have shown that since the 1960s drug offenders' treatment has moved through various stages of popularity, reaching its nadir with the view that "nothing works" but making a strong revival in the early and mid-1990s as the findings of the meta-analyses of the drug offender treatment literature became more widely disseminated (Hollin, 2001). However, over the past decade the analyses have heralded a shift away from "nothing works" towards "what works" (McGuire, 1995). It is in support of this broad backdrop of "something works" that this work opens with a brief consideration of the central insight of symbolic interactionism, Differential Association, Social Capital theories and social learning theory.

Symbolic Interaction Theory – is a sociological approach developed in turn by group of sociologists at various times i.e. Blumer, Becker, Goffman, Denzin, and Hochschild. Though the symbolic interaction perspective is sometimes associated with Mead, it was Herbert Blumer, the man that coined the term symbolic interactionism in 1937 that took Mead's ideas and developed them into a more systematic sociological approach. Symbolic interaction refers to the peculiar and distinctive character of interaction as it takes place between human beings. The peculiarity consists in the fact that human beings interprete or "define" each other's actions instead of merely reacting to each other's actions. Their "response" is not made directly to the actions of one another but instead is based on the meaning which they attach to such actions. Thus, human interaction is mediated by the use of symbols, by interpretation, or by ascertaining the meaning of one another's actions. In other words, symbolic interactionists opine that society is possible because human beings have the ability to communicate with one another by means of symbols. To them, people act toward another, objects, and events on the basis of the meanings that individuals impart to them. As a result of this, people experience the world as constructed reality.

Blumer came up with three core principles to his theory. They are meaning, language, and thought. These core principles lead to conclusions about the creation of a person's self and socialization into a larger community (Griffin, 1997)

The first core principle of meaning states that humans act toward people and things based upon the meanings that they have given to those people or

things. Symbolic Interactionism holds the principal of meaning as central in human behavior. *The second core principle* is language. Language gives humans a means by which to negotiate meaning through symbols. Naming assigned meaning, thus naming was the basis for human society and the extent of knowledge. It is by engaging in speech acts with others, symbolic interaction, that humans come to identify meaning, or naming, and develop discourse (Griffin, 1997). *The third core principle* is that of thought. Thought modifies each individual's interpretation of symbols. Thought, based-on language, is a mental conversation or dialogue that requires role taking, or imagining different points of view.

The problem of drug addicts with addiction can be explained using the lens of the three core principles of Symbolic Interactionism as outlined by Herbert Blumer. The first miscommunication that drug addicts have falls under the principal of meaning. Worldwide, psychoactive substances are expected to be used for medical purposes alone (a psychoactive drug is a chemical substance that crosses the blood–brain barrier and acts primarily upon the central nervous system where it affects brain function, resulting in changes in perception, mood, consciousness, cognition, and behavior). However, these substances though illicit in Nigeria, are used for recreational purposes and therapeutically as non prescriptive medication by many because of the different meanings and understanding that people have as far as potentials of these substances are concerned. People depending on psychoactive drugs have assigned different meanings to how these substances should be used.

The second miscommunication however, falls under the principle of language. The symbol 'drugs' is very ambiguous to many Nigerians. The language 'drug', its potentials and benefits may sound attractive to people and thereby lure them into its indiscriminate and non medical use. Some users may even pretend to ignore its consequences when it is taken excessively just because of its effects on the central nervous system where it affects brain function. But in medical parlance the language 'drug' for psychoactive substances takes a specific meaning that the substances can only be useful when it is used medically and not otherwise. Because there are two different situations with the same name, the two groups of people here fell upon a misunderstanding.

The third miscommunication falls under the principal of thought. In the internal dialogue of drug addicts, the symbol 'drugs' will be interpreted through their thought process based on their naming system. Here, the drug users' thought processes have modified their interpretation of the language 'drug'. Based on their meaning for the language 'drug' they have internal dialogue and come to the conclusion that drug should be taken. Their thought processes have modified their interpretation of the language and they will act based on that meaning.

In relation to the above, drug addicts can only be effectively helped to return to their normal functioning in the society by working on the meaning, language, and thought they have as far as drugs are concerned. To motivate them to drop drug dependence, ambiguity embedded in the meaning of drugs should be removed. Also, various negative consequences of psychoactive substances should be explained to them. There is the need to convince them to see what they stand to benefit when they are left off the hook of illicit drug consumption. In essence, the symbolic interactionism assume that the drug addict can be assisted to have insight into or discover what he/she requires to solve his addiction and so the client-centred therapy can enable the drug dependent patient to find out how he has contributed to his drug problem and that he has some degree of freedom to choose socially acceptable alternatives to drugs through a change in the meaning, language, and thought.

Differential Association Theory – this is a theory of social learning that offers explanation on how value-based and interpersonal conflicts are resolved (Sutherland and Cressey, 1978). The basic assumption of the theory is on influence of peer group and the definitions of this group to what is desirable and non-desirable (Akers, 1997). According to differential association theorists, criminal behavior is learned during the course of communication with others in the group. According to Akers (1998), differential association referred to the different groups of people with which an individual interacted, some of which defined criminal behavior as acceptable and some of which did not.

However, such learning is best achieved when done within intimate peer associations. With his theory of differential association, Sutherland attempted to identify universal mechanisms that explain the genesis of crime regardless of the specific concrete structural, social, and individual conditions involved. Sutherland in essence in his theory, meant that other agents of socialization such as media and other big social group have little and insignificant influence on individual's learning and internalization of criminal behavior.

From the point of view of differential association theory, people abuse illicit drugs and become addicted because they learn the act of drug taking from members of the group to which they belong. People that were initially not drug addicts pick up drug taking habit because of the frequency, duration, priority and intensity of socialization they get from the real drug addicts in the small and the intimate group to which they belong. Addictive behavior was learned among the small group has become an acceptable and normative for the drug addict because of his acceptance of the group sets of values and norms. However, to ensure rehabilitation and reintegration of the addicts, the addicts must disengage

from other addicts in order to unlearn drug addicts' values and norms and also to learn drug-free lifestyle from non-drug addicts in the society.

III. Social Learning Theory

Another sociological theory that has relevance to the understanding of drug addiction and rehabilitation is Social learning theory of Akers (Akers, 1977, 1985, 1998). This theory explains the role of learning in the initiation and continuation of drug use. Of utmost importance to social learning theory is the idea that people learned through a process of social reinforcement. The theory in essence claims that people who abuse drugs are often playing the role of reinforcing the behavior of their friends. Central to the understanding of social learning theory according to several works of Akers and others is their eliance on operant conditioning to describe the process through which behavior was shaped by its consequences. From the understanding of social learning theory it is assumed that individuals that become addicted to drugs must have embraced the use of drugs as an attempt at problem solving. Corroborating the assertion of Akers, findings from the work of Brezina (1996, 2000) indicate that people who used drugs from the point of view of social learning theory can be referred to as individuals that are in search of solutions to a problem. However, from the perspective of social learning theory, the role of perceptions of drug use as a problem solver was examined as a type of reinforcement for drug use i.e. those who continued to use drugs are the people who have realized that drug is fulfilling the function for which they are taking the drug.

As part of means of treating drug addicts to be freed from drug use, social learning theory advocates that it is important to consider the actual reasons people are using drug in the first place, and that social learning theory will help in determining reasons for the use of drugs. When these reasons are ascertained, social learning theorists advocate that drug users should be subjected to treatment and also be educated on why they should avoid drugs totally.

Social Capital Theory – many studies in recent times and in contemporary literature have made the theory of social capital their focal point. The theory in the 21st century has gained more currency in term of use than earlier times. The spate at which the theory is being used in recent times and it acceptance among social thinkers and researchers has arguably made the concept one of the most successful 'exports' from sociology to other social sciences and to public discourse during the last three decades (Portes, 2000; Adam and Roncevic, 2003). Evidences from scholastic writings are pointer to the fact that Social capital as a term evolved from the works of two major writers, John Dewey and L.J. Hanifan as early as 1900, however, the initial theoretical development of the concept and the popularity the term has garnered in academic circles have been traced and attributed to contributions of scholars such as French sociologist Pierre Bourdieu, Robert Putnam and American sociologist James Coleman (Portes, 2000; Farr, 2004).

Social capital is all about peoples' co-operative networks based on regular, personal contact and trust. Social capital from sociological point of view highlights the importance and the need for community strength or communal vitality. The theory in essence reiterates the importance of development of voluntary collective action to the problem of common action. Forms of social capital are general moral resources of the community, and they can be divided into three main components: trust, social norms and obligations; and social networks of citizens' activity, especially voluntary associations. social capital is seen as trust in social relations (Fukuyama, 1995); as civic engagement created through participation in voluntary associations (Putnam, 1995); as a social fabric that creates a willingness to cooperate in the development of physical capital (Ostrom, 1994); as an explanatory variable in the generation of human capital between generations (Teachman et al., 1997); and as an aspect of social structure that facilitates particular forms of action and cooperation (Coleman, 1987; Greeley, 1997).

Social capital refers to those stocks of social trust, norms and networks that people can draw upon to solve common problems. It is all about the value of social networks, bonding similar people and bridging between diverse people, with norms of reciprocity. Social capital refers to the institutions, relationships, and norms that shape the quality and quantity of a society's social interactions. A narrow view of social capital regards it as a set of horizontal associations between people, consisting of social networks and associated norms that have an effect on community productivity and well-being. In societies where government social capital is limited, a large proportion of contracts may depend on civil social capital and trust. Rose (1999) in a social capital study in Russia found that individuals invoke networks that involve informal, diffuse social co-operation to compensate for formal organization failure.

The import of this theory is all about the helpless situation in which drug addicts find themselves as far as coming out of addiction or drug dependence is concerned. As individuals, drug addicts with heavy load of effects of addiction on their shoulders cannot help in extricating themselves out of the quagmire of addiction in which they are enmeshed, this is so because addiction is a complex problem and tackling it requires strongly rooted social support from drug free individuals in the community, more than a single treatment for the drug addicts to return to productive functioning in the family, workplace, and society. Also, for any treatment to be effective, it must be one that attends to the multiple

needs of the individual, not just his or her drug abuse. To be effective, treatment must address the individual's drug abuse and any associated medical, psychological, social, vocational, and legal problems. It is also important that treatment be appropriate to the individual's age, gender, ethnicity, and culture (NIDA, 2009). As isolated individuals, drug addicts are hampered by factors such as lack of wherewithal, time, expertise, and social support that are required to enhance their full rehabilitation and social reintegration back to the society as drug free individuals. However, to achieve this, the commonly accepted and the beneficial cooperative behavior of Nongovernmental organizations which are the real essence of social capital are needed, since social capital is the cumulative capacity of social groups to cooperate and work together for the common good (Montgomery 1998).

IV. Conclusion

Globally, the quest to explain the issue of drug abuse and addiction has gained considerable attention over the years. Scholars from both the social and medical sciences have discussed extensively this twin evil in their several studies. However, this study preoccupies itself with assessing how well micro-level sociological theories can explain factors influencing drug abuse and addiction and the effective ways of rehabilitating drug addicts in the society. In line with these micro-level sociological theories, punitive measures to the problem of drug abuse and addiction should be discouraged while treatment-oriented strategies should be encouraged to effectively cater for several drug related problems.

In accordance with treatment-oriented strategies as discussed above, these theories advocate the need to consider the individual aspects of offenders (drug) to determine the most effective prevention strategy. In essence, individual–level approach sees rehabilitation and reintegration as the viable means to help drug addicts return to their former productive levels in the society.

References Références Referencias

1. Akers, R. (1977). Deviant behavior: A social Learning Approach (2nd ed.). Belmont, CA7 Wadsworth.
2. Akers, R. (1985). Deviant behavior: A social Learning Approach (3rd ed.). Belmont, CA7 Wadsworth.
3. Akers, R. (1998). Social learning and social structure: A general theory of crime and deviance. Boston7 Northeastern University Press.
4. Brezina, T. (1996). Adapting to strain: An examination of delinquent coping responses. Criminology, 34, 39–60.
5. Brezina, T. (2000). Delinquent problem-solving: An interpretive framework for criminological theory and research. Journal of Research in Crime and Delinquency, 37, 3– 30.
6. Farr J. (2004). A Conceptual History. *Political Theory*, Vol. 32, No. 1, 6-33, Sage Publications, Inc.
7. Griffin, E. (1997). A First Look at Communication Theory. New York: The McGraw-Hill Companies.
8. Hollin, C.R. (2001a). To treat or not to treat: An historical perspective. In C.R. Hollin (Ed.), *Handbook of offender assessment and treatment (pp.* 3-15). Chichester: John Wiley & Sons.
9. Makanjuola, Daramola and Obembe (2007) Psychoactive substance use among medical students in a Nigerian university. World Psychiatry. 6(2): 112–114. PMCID: PMC2219911
10. McGuire, J. (Ed.). (1995). *What works: Reducing reoffending.* Chichester: John Wiley & Sons.
11. NIDA, 2006. *The National Treatment Improvement Evaluation Study (NTIES)*: Highlights. DHHS Publication No. (SMA) 97-3159.
12. NIDA, 2007. Drugs, Brains, and Behavior - The Science of Addiction. PubMed
13. NIDA, 2009. Principles of Drug Addiction Treatment. A research based guide, 2nd edition. National Institutes of Health U.S. Department of Health and Human Services
14. Ostrom, E. (1996). Crossing the great divide: Co-production, synergy and development. *World Development* 24:1073-87.
15. Parul, L. and Arun, K. 2007. Drug Abuse, an International Problem: *Indian Journal of Forensic Medicine & Toxicology*. Vol. 1:1, pages 7- 12.
16. Putnam D (1995). "Bowling alone: America's declining social capital." *Journal of Demoracy* 6:65-78.
17. The Society for More Creative Speech. (1996). Symbolic Interactionism as Defined by Herbert Blumer.http://www.thepoint.net/-usul/text/blumer.html
18. UNODC, 2010. World Drug Report. United Nations Office on Drugs and Crime. Vienna.

This page is intentionally left blank

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Condom Myths and Misconceptions: The Male Perspective

By Daniel Yaw Fiaveh
University of Ghana, Legon, Ghana

Abstract – Despite extensive efforts in promoting condom use, men still engage in risky sexual behaviors due to certain myths and misconceptions. Considering the threat posed by HIV to the development of Africa, this study investigates condom myths and misconceptions among 600 adult men in a West African University population. The mean age was 24 years, about 70% of the respondents were between 19-24 years. About 60% of men had engaged in sexual intercourse, a little over half knew about condoms and four out of five men had used condoms. More than half (60.8%) of the men were of the view that proper use of condom is a protection against HIV and about one-fifth (of those who had had sex) perceived the use of condom as inferior. The study revealed that condom use was associated with condom myths and misconceptions (condom sex is inferior; condom reduces pleasure, condom reduces erection). However, most men would use condom in order to prevent a partner from refusing sex. Various governments and civil society organizations are to contribute towards the expansion of protective behaviour among men and women through condom promotion.

Keywords : *Male perspective; condom myths and misconceptions; condom use; HIV; masculinity.*

GJMR-I Classification : *NLMC Code: QT 225*

Strictly as per the compliance and regulations of:

Condom Myths and Misconceptions: The Male Perspective

Daniel Yaw Fiaveh

Abstract - Despite extensive efforts in promoting condom use, men still engage in risky sexual behaviors due to certain myths and misconceptions. Considering the threat posed by HIV to the development of Africa, this study investigates condom myths and misconceptions among 600 adult men in a West African University population. The mean age was 24 years, about 70% of the respondents were between 19-24 years. About 60% of men had engaged in sexual intercourse, a little over half knew about condoms and four out of five men had used condoms. More than half (60.8%) of the men were of the view that proper use of condom is a protection against HIV and about one-fifth (of those who had had sex) perceived the use of condom as inferior. The study revealed that condom use was associated with condom myths and misconceptions (condom sex is inferior; condom reduces pleasure, condom reduces erection). However, most men would use condom in order to prevent a partner from refusing sex. Various governments and civil society organizations are to contribute towards the expansion of protective behaviour among men and women through condom promotion.

Keywords : Male perspective; condom myths and misconceptions; condom use; HIV; masculinity.

I. Introduction

The aim of this paper is to investigate condom myths and misconceptions as barrier-protection mechanisms to HIV transmission in a West African University population. Findings would contribute to policy formulation with regard to expanding protective behaviour among sexually active men and women particularly for disease (STI/HIV and AIDS) prevention.

In discussions of gender and HIV/AIDS, men are usually regarded as agents of infection (Connell, 2005), although some would argue to the contrary. Although some attempts have been made to engage with men's contribution towards HIV and AIDS prevention (e.g. The Role of Men and Boys in Achieving Gender Equality by the United Nations Commission on the Status of Women, 2004), almost all major policy discussions (such as the UN CEDAW, 1997; UN Beijing Declaration and Platform for Action, with the Beijing +5, 2001), often do not name men as a group and rarely discuss men in concrete terms. Insofar as gender is so often equated with women, the move from Women in Development (WID) to Gender and Development (GAD) is unlikely to achieve enduring, if any, success (Chant and Gutmann, 2002; Cleaver, 2002).

Author : Department of Sociology, University of Ghana, Legon, Ghana. (Correspondent) E-mail: fiaveh@yahoo.com

HIV and AIDS continue to pose major challenges to the economic development of Africa–1.4 million Africans died from HIV and AIDS (UNAIDS, 2008). Africa is among the areas with the largest of the global percentage of People Living with HIV and AIDS (between 15-49 years) with low (22%) modern contraception use (WHO, 2008; Population Reference Bureau, 2008). In Sub-Saharan Africa, for example, about 22.5 million people are living with HIV and AIDS (NACP, 2011).

Despite all efforts, the overall use of condoms remains low, and attempts at increasing condom use among sexually active people is still a challenge. Meekers et al. (2003), while describing the levels of sexual risk behaviour and condom use among some unmarried youth in Cameroon (N=1,956), disclosed that a substantial segment of young men in particular did not use condom consistently although they had high rates of multiple sexual partners. Similarly, Ntata et al. (2009), found that many first-year Malawian undergraduates (N= 314) did not use condom consistently regardless of their high level of HIV knowledge.

Some have argued that the reason why HIV continues to pose a major challenge to men and women is mainly because of some masculine constructs, key among which are men's refusal to use condom (Baumeister et al., 2001) and their infidelity (Anarfi, 2006). Although increased resources are being committed to the health sector but principal indicators still show a worsening situation with a national average of about 50% of the population with access to health care (NACP, 2011).

Although, statistics offers some prospects for Ghana–1.5% of PLW HIV and AIDS (NACP, 2011) compared to other countries in the sub-region, there is still much to be done. For instance, condom use in Ghana has increased over the years (from 28 to 33.4 percent in women and from 44 to 52 percent in men), with a high HIV awareness level (about 92% to 98%) but condom use continues to be viewed as inferior (Fiaveh, 2011; NACP, 2011). Nearly 90 percent of infections in Ghana occur within the age group of 15-49 years, with 58 percent of infected people being women and girls (NACP, 2011). A significant number of young men engage in risky sexual behaviors due to certain myths and misconceptions (Biddlecom et al., 2007, WHO, 2010). The misconceptions are that condom use reduces pleasure, condom use leads to loss of erection,

sexual act with a condom is inferior, and condom use implies sexual promiscuity (Adetunji & Meekers, 2001; Maharaj, 2005; Tweedie & Witte 2000). The HIV rates among members of the University of Ghana community are unknown. However, since the majority of them are youths, they belong to that section of the Ghanaian population which is the vulnerability group (Fiaveh et al, 2011).

Evidence suggests that the consistent and proper use of condoms could reduce the risk of being infected with HIV (Bankole et al, 2009; WHO, 2004). Since the youth are the most economically productive segment of the population, who are being trained to steer the country towards its growth and development, illnesses and deaths in this age group (15-49 years) constitute an immense economic burden, resulting in a huge loss of productive years and investment in education and training (Oti-Boateng, 2006). Therefore, there is need to interrogate those factors which act as barrier protection to HIV and AIDS among men.

II. Research Method

This study was conducted in a West African university population. The university had a student population of 42,692, representing 58.78% male, 41.22% female, and a staff strength of about 5004, representing 76.96% males and 23.04% females. Studies have shown that there is increased sexual promiscuity on this University population (Manuh et al., 2007; Oti-Boateng, 2006; Tagoe & Aggor, 2009), with low (13.7%) prevalence rate of condom use (Tagoe & Aggor, 2009). More importantly, there is an increasing strategy to use sexually active educated people as a gateway to HIV prevention in West Africa (Anarfi, 2006; Prince & Bernard, 1998).

The study design was a cross sectional survey. We compared men who are sexually active heterosexuals with their counterparts who have not ever had sex. A mixed method of data collection was employed. Thus, although the main approach to data collection was the use of a structured questionnaire, some follow up interviews were conducted.

a) Recruitment and Procedures

Data presented in this article were drawn from a cross-sectional study comprising survey research conducted from August 2010 to February 2011 and in-depth interviews conducted from February through April 2011.

As noted by Babbie (2005) and Frankel & Wallen (2002), a small, but carefully chosen sample size could be representative of a study population. Overall, a 2% sample of the total male population (for students and staff) of the university was sampled. The sample size computed was 579 but it was approximated to 600(see Table 1). In addition, 10 follow up interviews were purposively conducted. Respondents were recruited based on the quantitative responses given, to which we seek further clarifications for.

The sampling procedure adopted in this study was a stratified random sampling technique. As noted by Kumekpor (2002:149), stratified sampling helps to carry out investigations of specific characteristics (such as population size, residence, sex and beliefs) of particular aspects of the population, while making a general study of the different populations as a whole. To this end, stratified sampling was used in recruiting respondents from the population of students and staff. The study conformed to the required ethical guidelines (see Appendix 1) and informed consent was sought.

Table 1 : Male population and computed sample

	Population (μ)	Sample size
Students	25095	520
Staff	3851	80
Total	28946	600

b) Mode of Analysis and Main Variables

The variables examined were broadly categorized as socio-demographic; Sexual behavior and condom practice; and condom myths and misconceptions. The socio-demographic variables included age, highest level of education, religion and marital status (single, married, divorced or widowed). Sexual behavior and condom practice was measured on the basis of ever had sex, ever used condoms, knowledge of condom use and condom brands. Additionally, variables relating to myths and misconceptions about condom use included: the use of condom sex is inferior, sex with condoms reduce pleasure, condom use means sexual promiscuity, and the influence of condom myths and misconceptions on first time use of condoms. The selection of this method was informed by the ease of administration and eliciting response, and the validity and reliability of the instruments used.

Statistical analyses were done using the quantitative Statistical Package for the Social Scientist (SPSS version 16). An appropriate measure of centrality (e.g. mean age) was computed and for the comparison of variables, a chi square test (for religion, condom myths and condom use) was computed with significance level stated as 'p value'. The confidence level was 95% ($p<0.05$). The qualitative data were analysed manually and are embedded in the results section of the paper.

III. Results

a) Demographic Characteristics

About 80% of men had completed Senior High, Vocational or Technical school education. This was because large numbers of these students constituted the undergraduate population on campus. The mean

age was 24.1 years with over 70% of respondents between 19-24 years. The majority of the respondents were undergraduates who were in their first and second year. About 90% were Christians while nine of ten men had never been married (Table 2).

Table 2 : Demographic characteristics (N=600)

Variable	%
Age bracket	
19 years or younger	13.2
20 - 24 years	61.5
25 - 29 years	14.5
30 years or older	10.8
Level of education	
Middle/JHS[1]	1.7
SHS/Voc/Tech[2]	84.2
Post SHS/Nursing/Poly[3]	3.2
University	11.0
Total	100
Religion	
Christian	89.8
Islam	6.0
Others[4]	4.1
Marital status	
Never married	90.3
Married/living together	9.0
Separated/widowed	0.6

1 Middle school and JHS refers to Junior High School 2 Senior High School; Voc refers to Vocational Training and Tech refers to Technical training 3 Post Senior High School; Polytechnic 4 Traditional, no religion, etc.

b) Sexual behavior and condom practice

About 60 % of men reported that they had experienced sex and a little over half (55.3%) knew about condoms. Out of the number of men who had ever had sex, 73% had knowledge about how to use condoms and 80% had used condoms. 'Champion' condom was the most popular brand of condom that men knew (30%). Other brands of condoms men knew were Aganzi, Rough Rider, Panther condom and Gold circle (Table 3). The survey asserts that no significant statistical association exists between religion and condom use (Table 4)].

Table 3 : Experience of sex and knowledge of condom use (N=600)

Variable	%
Have you ever had sex	
No	41.0
Yes	59.0
Knowledge of condom use	
No	25.5
Yes	73.4
Ever used condom	
Yes	80.1
No	19.9
Condom brands[1]	
Aganzi	3.3
Gold cycle	8.3
Rough rider	11.3
Don't Know	14.5
Panther	14.5
Champion	29.6
Other brands[2]	18.5

1 n≠600 (n=360) 2 Bazooka, spicy love, Trojan, wet & wild, erotic, VIP, etc.

Table 4 : Religion and condom use (N≠600) ^

Variable	Ever used condom (%)		χ2 (df)	p value
Religion	**Yes**	**No**		
Christian	254(91.4)	61(88.4)		
Islam	13(4.7)	5(7.2)	2.164(4)	0.706
Others[1]	11(4.0)	3(4.3)		
Total	278(100)	69(100)		

1Traditional, no religion, etc. ^ some respondents had never had sex and some never used condoms
**p<0.001 **p<0.05*

c) Condom Myths and Misconceptions

More than half (60.8%) of the men interviewed in this study said that a correct use of the condom guarantees safety from HIV. For those men who had never had sex, a little over two-thirds were of the view that condom use protects against HIV. Of the total number of men who had ever had sex, 40% of them perceived that condom use reduces pleasure/sensation. Only a few men (of those who had ever had sex) perceived that condom use reduces erection. About 43% of men who had never had sex could not guarantee that the use of a condom reduces erection. Overall, about 9% of men were of the view that erection is psychological and nothing to do with condom use (Table 5).

About one-fifth of men (of those who had ever had sex) believed that having sexual intercourse using a condom was inferior. To these men having sex with a condom leads to the mistrust of a partner which does not augur well for a good relationship. Other men also claimed that having sex with the use of a condom is not natural, and this goes against their religious persuasions. From another view point, some men believed that having sex using a condom is not inferior. To them, 'good sex' depends on the brand of condom that is used (Table 5).

Whereas some men (11.1%) were of the view that condom use encourages sexual intercourse with multiple sexual partners, about 62% of men (of those who had ever had sex) were also of the view that using a

condom for sex does not amount to sexual promiscuity. To these men, people use condom for various reasons key among which are due to the mistrust of a partner, and for protection against HIV (Table 5).

Table 5 : Condom myths and misconceptions (%)

	Ever had sex (n=360)	Never had sex (n=240)	Total[1] (n=600)
Condom protects against HIV			
Yes	69.4	44.2	60.8
No	28.3	40.4	34.0
Don't Know[2]	.8	11.7	5.3
Missingness	1.4	3.8	
REASONS (protects against HIV or not)			
Condom is for prostitutes	.6	27.5	.3
Condom is not 100% safe	21.9	.4	24.7
Depends on the brand	.3	.4	.3
It's safe	32.5	19.2	30
No reason	26.4	27.9	27.6
Prevents direct blood/fluid contacts	16.1	9.2	13.7
Don't Know[2]	.8	11.7	5.3
Missingness	1.4	3.8	
Condom reduces pleasure/sensation			
Yes	55.6	10.4	39.8
No	21.7	10.4	18.2
Don't Know[2]	18.3	71.7	42.0
Missingness	4.4	7.5	
REASONS (reduce pleasure or not)			
Depends on the brand of condom	.3	.4	.4
It's Psychological (the mind)	.8	.8	.9
No reason	30.8	6.2	22.3
Not an issue	9.4	5.0	8.1
Not natural (No body contact)	34.7	7.9	25.5
Tightens the penis /Causes early ejaculation	.8	.4	.7
Don't Know[2]	18.3	71.7	42.1
Missingness	4.7	7.5	
Condom reduces erection			
Yes	14.7	1.7	10.0
No	60.6	19.6	46.5
Don't Know[2]	20.8	72.1	43.5
Missingness	3.9	6.7	
REASONS (reduces erection or not)^			
Enhances prolonged erection	3.1	2.5	1.9
It's Psychological (the mind)	3.3	.4	3.4
No connection between condom use and erection	6.4	4.2	5.8
No reason	41.4	10.8	30.7
Not an issue	12.8	1.7	8.8
Not natural (No body contact)	6.1	1.2	4.4
Tightens the penis /Causes early ejaculation	2.2	.4	1.6
Don't Know[2]	20.8	72.1	43.5
Missingness	3.9	6.7	
Condom sex is inferior			
Yes	27.8	7.1	20.7
No	46.1	17.1	36.6
Don't Know[2]	21.1	69.2	42.8
Missingness	5.0	6.7	
REASONS (inferior sex or not)			
Mistrust	1.7		1.1
To prevent STI/HIV	4.4	1.2	3.4

Depends on the brand of condom	.3		.2
It's safe	3.6	2.9	3.5
No reason	34.7	10.4	26.5
Not an issue	10.8	5.4	9.2
Not natural[3]	18.3	3.8	13.3
Religious reasons		.4	.2
Don't Know[2]	21.1	69.2	42.8
Missingness	5.0	6.7	
Condom use is sexual promiscuity (not faithful)			
Yes	12.5	7.5	11.1
No	69.2	43.3	62.3
Don't Know[2]	13.6	42.5	26.6
Missingness	4.7	6.7	
REASONS (promiscuity or not)			
Encourages multiple sexual partnership	6.1	5.4	6.2
To prevent STI/HIV	21.9	11.7	18.8
It's safe	8.6	6.2	8.1
No reason	28.9	16.2	25.2
Not an issue	5.0	3.8	4.8
Religious reasons	.3		.2
To prevent unwanted pregnancies	10.8	7.9	10.2
Don't Know[2]	13.6	42.5	26.6
Missingness	4.7	6.2	

1Percentages adjusted for missing values 2 Respondents never used condom/ never had sex 3 No body contact ^ percentages not equal to 100%

Regarding myths about condom brands, the 'Champion' and 'Panther' condoms were regarded by men as inferior in sensation. Nonetheless, some used them when necessary. According to a respondent, for example,

> *Wu ye matsuo[1] is ma emergency contraceptive if I have no money for ma roughrider, cos I no wan lose am [Without a condom, at least a champion condom, the girl would refuse to have sex with me].*

d) Influence of condom myths/misconceptions on condom use

Table 6 measures the relationship between the influence of condom myths and misconceptions on the use of condoms among men who ever had sex. The findings revealed that certain misconceptions about the condom do not influence condom use among men. Thus, men's use of condoms was not influenced by the myth that condom use amounts to sexual promiscuity. Nonetheless, men's condom use had a significant association with the misconception that the use of condoms is inferior sex, condom reduces pleasure, and condom use reduces erection during sex (Table 6).

Table 6 : Condom myths/misconceptions and condom use (N ≠ 600)1

Variable	Ever use of condom		$\chi 2$ (df)	p value
Condom protects against HIV	Yes	No		
Yes	197(72.2)	41(59.4)	7.255(2)	.027**
No	75(27.5)	26(37.7)		
Don't Know[2]	1(.4)	2(2.9)		
Total	273(100)	69(100)		
Condom reduces pleasure/sensation				
Yes	161(61.2)	39(57.4)	19.815(2)	.000*
No	70(26.6)	7(10.3)		
Don't Know[2]	32(12.2)	22(32.4)		
Total	263(100)	68(100)		

[1] A popular advert on the Ghanaian Television in the Akan Language (one of the Kwa linguistic groups in Ghana) where the champion condom is personified as a man of valor.

Condom reduces erection				
Yes	45(17)	8(11.6)	23.186(2)	.000*
No	183(69.3)	34(49.3)		
DK	36(13.6)	27(39.1)		
Total	264(100)	69(100)		
Condom sex is inferior sex				
Yes	73(27.5)	25(39.1)	20.919(2)	.000*
No	147(55.5)	16(25)		
Don't Know[2]	45(17)	23(35.9)		
Total	265(100)	64(100)		
Condom use is sexual promiscuity				
Yes	35(13.3)	8(11.9)	3.438(2)	.179
No	197(74.6)	45(67.2)		
Don't Know[2]	32(12.1)	14(20.9)		
Total	264(100)	67(100)		

1 computed for respondents who had ever had sex 2 Respondents never used condom
*p<0.001 **p<0.05

Our follow-up interviews corroborate data gathered from the survey regarding the influence of condom myths and misconceptions on the use of a condom.
According to a respondent,

> *Me and my partner use the pill more because it keeps the babies away and keeps our sensation alive (student, 24).*

Another stated,

> *the condoms that are given out for free are not quality condoms. 'Please tell those sharing them to give out roughrider and we will use them' (student, 18).*

Others think the condom tightens their penis which eventually leads to loss of erection. For example, a respondent claimed that

> *Condom produces unpleasant scent and peeves my penis; this is why I don't like it (man, 24).*

Jokingly, some said,

> 'All die be die' [with a laugh]. Wu nnim se *Berma na tuo tua esini bu? [don't you know that a man must be fearless and a risk taker?]—student, 25*

IV. Discussion and Conclusion

This study investigated the influence of condom myths and misconceptions as a barrier protection to HIV transmission in a West African University population. This study argues that no significant association exists between religion and men's use of a condom, particularly for those men who have ever had sexual intercourse (Fiaveh, 2011). Thus, a man may use a condom or not regardless of his religious persuasion.

While this study corroborates other studies (e.g. GDHS, 2008; NACP, 2011) regarding the high knowledge of condom use in Ghana, we also found that the majority of the men, that is, almost one-third thought that condom use does not guarantee protection against HIV-most of them had never had sex. Perhaps, the perception that condom use does not give protection against HIV may appear to have influenced some men's choice for abstinence since they could not guarantee their trust of a partner. However, it is also possible that upon meeting a partner they consider as trustworthy, they are likely not to use condom during sex.

Although the majority of men had knowledge of HIV prevention through condom use, this was partly due to their educational level. The majority of respondents had attained at least a vocational or a secondary school education and was pursuing or had already attained a university education. Therefore, it is expected that people with this level of knowledge would be better informed about their health and diseases compared to those with little or no formal education (Assimeng, 2006; Okyerefo, 2005, emphasis added).

Misinformation about condom use is also widespread among men and the belief that sex with a condom is inferior sex is also common among men, particularly, in this study. Sexual pleasure, therefore, is a significant aspect of masculine identities (Awusabo-Asare et al., 1999; Campbell, 1997; Fiaveh, 2011; Szabo & Short, 2000). This corroborates research that states that men think about pleasure first before thinking about their health (Campbell, 1997; Awusabo-Asare et al., 1999).

More importantly, the condom is also viewed among some men as the last resort to have sexual intercourse. Thus, depending on its availability, safe sex could be initiated by a man or not. It is this that makes condom brands a very significant aspect of unsafe sex. For instance, some condoms are perceived as more pleasurable to use. In this study, for example, while the

'Champion' condom was the most popular brand of condom that men knew, it was not the most widely used brand of condom among them.

Although the majority of men (who have ever had sexual intercourse) know that condom use protects against HIV, a significant number of them think that having sex with the use of a condom is inferior because it reduces sexual pleasure. However, it is good to note that some men acknowledge that their sexual partners would refuse to have sex with them if they [men] refuse to use a condom. This means that men would prefer to use a condom regardless of the brand in order not to have their partners refuse them sex. Findings from this study, therefore, do not support the view that men would resort to violence if their partners refuse them sex for lack of condom (Boafo, 2011:15).

In conclusion, knowledge generated in this study suggests that sexually active men should not only know about condoms, but also correct the sort of misconceptions they hold about its use. It is evident that the belief in myths about condom use influence action (i.e. abstinence or condom use/nonuse). This calls for an understanding of the worldview of people particularly on the use of condoms (Assimeng, 2006, emphasis added).

Encouraging condom use should be a major focus for HIV/STI prevention in West Africa. Therefore, all stakeholders (including governments, and civil society organizations) should contribute towards the expansion of protective behaviour among men and women through condom promotion as condom manufacturers strive to improve upon condom 'pleasurability'[2]. Health practitioners should also give out pleasurable condoms as a form of campaign strategy. This could help change the way the condom is perceived mainly as a birth control method rather than a barrier protection to disease prevention. To this end, there is the need empower men and women through education on the need to be health conscious in order to insist on the use of condom with a partner they perceive as not trustworthy.

References Références Referencias

1. Adetunji, J. & Meekers, D. (2001), Consistency of Condom Use in the Context of AIDS in Zimbabwe, Journal of Biosocial Science, 33:121–38.
2. Adih, W.K., & Alexander, C.S. (1999), Determinants of Condom Use to Prevent HIV Infection among Youth in Ghana, J. Adolesc Health, 24 (1): 63-72.
3. Anarfi, J.K. (2006), Talking and Deciding about Sex and Contraception in Ashanti Towns, in Oppong C, Oppong M.Y Odotei I (ed) (2006), Sex and Gender in an Era of AIDS: Ghana at the Turn of the Millennium, Accra: Sub Saharan Publishers.
4. Assimeng, M. (2006), Understanding society: An Introduction to Sociology for African Students, Accra: Woeli Publishing Services.
5. Awusabo-Asare, Kofi et al. (1999), All Die be Die: Obstacles to change in the face of HIV infection in Ghana, in National Centre for Epidemiology and Population Health (1999) Resistance to Behavioral Change to Reduce HIV/AIDS Infection, Canberra: Australian National University.
6. Babbie, E. (ed.) (2005), The Basics of Social Research, 3rd edition, Canada: Wadsworth.
7. Biddlecom, A.E., Hessburg, L., Singh, S., Bankole, A. & Darabi, L. (2007), Protecting the Next Generation in Sub-Saharan Africa: Learning from Adolescents to Prevent HIV and Unintended Pregnancy, New York: Guttmacher Institute.
8. Boafo, I.M. (2011), Dating Violence and Condom Use Self-Efficacy: Among Adolescents, Saarbrucken, Germany: VDM Verlag Dr. Muller.
9. Bryan, A.D., Aiken, L.S. & West, S.G. (1999), The Impact of Males Proposing Condom Use on Perceptions of an Initial Sexual Encounter, Personality and Social Psychology Bulletin, 25(3): 275-286.
10. Campbell, C. (1997), Migrancy, Masculine Identities and AIDS: The psychosocial context of HIV transmission on the South African gold mines, Social science & medicine, 45 (2): 273-281.
11. Chant, S. & Gutmann, M.C. (2002, emphasis added), 'Men-Streaming' Gender? Questions for gender and development policy in the twenty first century. Progress in Development Studies, 2(4): 269-282.
12. Cleaver, F. (2002), Men and Masculinities: New directions in gender and development, in Cleaver, F. (ed.) Masculinities matter! Men, gender and development. New York: Zed Books. Pp. 1-27.
13. Connell, R. W. (2005), Change among the Gatekeepers: Men, masculinities, and gender equality in the global arena, Signs, 30 (3):1801-1825.
14. Coser, L.A. (eds.) (2004), Masters of Sociological Thought: Ideas In Historical and Social Context, New Delhi: Rawat Publications.
15. Fiaveh, D.Y, Okyerefo, M.P.K. & Fayorsey, C.K (2011), HIV Counseling and Testing Among Men in the University Of Ghana: Implications for Gender-Based HIV Prevention Interventions, Journal of AIDS and HIV Research, 3,3:90-99.
16. Fiaveh, D.Y. (2011), Male Perspective on Condom Use: Implications for STI/HIV. Saarbrucken, Germany: Lambert Academic Publishing.
17. Frankel, J. & Wallen, N.E. (eds.) (2002). How to Design and Evaluate Research in Education. Boston: MacGraw-Hill.
18. Ghana AIDS Commission (GAC). (2010), Progress Report.
19. Ghana Demographic and Health Survey (GDHS)

[2] To enhance sexual pleasure

(2008), Preliminary Report. Accra: Ghana Statistical Service, (April, 2009), pp.1-41.
20. Greene, M. & Biddlecom, A. (2000), Absent and Problematic Men: Demographic Accounts of Male Reproductive Roles, Demography, 26: 81-115.
21. http://www.un.org/womenwatch/daw/csw/csw48/ac-men-auv.pdf. Retrieved on November 7, 2011.
22. http://www.who.int/healthinfo/global_burden_disease/estimates_country/en/index.html. Retrieved Nov. 11, 2009.
23. Maharaj, P. (2005), Patterns of Condom Use: Perspectives of Men in Kwazulu-Natal, South Africa, Development Southern Africa, 22(2): 187-197.
24. Manuh, T., Gariba, S. & Budu, J. (2007). Change and transformation in the Ghana's publicly funded universities. Accra: Woeli Publishing Services.
25. Mead, G.H. (1982), The Individual and the Social Self: Unpublished Work of George Herbert Mead, Chicago: University of Chicago Press.
26. National AIDS/STI Control Programme (NACP) (2011), HIV Sentinel Survey and National HIV Prevalence. Progress Report. Accra: Ghana health service.
27. Ntata, P.R.T., Muula, A.S., Siziya, S. & Kayambazinthu, E.E. (2008), Gender Differences in University Students HIV/AIDS-Related Knowledge and Sexual Behaviours in Malawi: A Pilot Study, Journal of Social Aspects of HIV/AIDS, 5 (4):201-205.
28. Okyerefo, M.P.K. (2005), Pursuing an Effective Pre-University Education in Ghana: Theory and Praxis, Legon Journal of Sociology, 2 (1): 33-51.
29. Orubuloye, I.O. (2004), Sexual Behaviour, HIV/AIDS Awareness and Condom Use among Young People in the Era of HIV/AIDS Epidemic in Nigeria. A paper presented at the Department of Sociology, University of ado-ekiti, Nigeria. http://paa2004.princeton.edu/download.asp?submissionId=41116
30. Oti-Boateng, P. (May, 2006), Report on Situation Analysis of University of Ghana's Response to HIV/AIDS, Kumasi, Ghana: Kwame Nkrumah University of Science and Technology.
31. Population Reference Bureau (2008), 2008 World Population Data Sheet. http//: www.prb.org. Retrieved 03/10/209.
32. Prince, A. & Bernard, A.L. (1998), Sexual Behaviors and Safer Sex Practices of College Students on a Commuter Campus, Journal of American College Health, 47 (1):11-21.
33. Stein, Z. (1990), HIV Prevention: The need for methods women can use. American Journal of Public Health, 80: 460–462.
34. Szabo, R. & Short, R.V (2000), How Does Male Circumcision Protect Against HIV Infection? British Medical Journal, 320:1592-4.
35. Tagoe, M. & Aggor, R.A. (2009), Knowledge, Behaviour, Perceptions and Attitudes of University Of Ghana Students towards HIV/AIDS: What Does Behavioural Surveillance Survey Tell Us? Journal of Health and Human Services Administration, 3(1): 51-84.
36. Tweedie, I. & Witte, K. (2000), Ghana Youth Reproductive Health Survey Report, Accra: Ghana social marketing foundation.
37. United Nations (1997), CEDAW General Recommendation 23: Article 7, of the Convention (Political and Public Life), Adopted at the 16th Session of the Committee on the Elimination of Discrimination against Women.
38. United Nations (2001), Beijing Declaration and Platform for Action, with the Beijing +5 Political Declaration and Outcome Document, New York: Department of Public Information, United Nations.
39. United Nations Commission on the Status of Women (2004), The Role of Men and Boys in Achieving Gender Equality: Agreed Conclusions.
40. Williamson, L.M., Buston, K. & Sweeting, H. (2009), Young Women and Limits to the Normalisation of Condom Use: A Qualitative Study'. AIDS Care, 21 (5): 561-566.
41. World Health Organization (WHO) (2001), STI/HIV: The Condom Situation Assessment in 11 Asian and Western Pacific Countries (June).
42. World Health Organization (WHO) (2008), Report on the Global Aids Epidemic (Chapter 3): Addressing Societal Causes of HIV Risk and Vulnerability. http://www.who.int/healthinfo/globalburden_diseas/estimates_country/en/index.html. Retrieved Nov. 11, 2009.

Global Journal of Medical research
Volume 12 Issue 5 Version 1.0 June 2012
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Genotype-Environmental (G X E) Interaction for Body Weights for Kuchi Chicken Ecotype of Tanzania Reared Under Intensive and Extensive Management

By J. Lwelamira
Institute of Rural Development Planning, Dodoma, Tanzania.

Abstract – This study was carried out with the aim of determining magnitude of G x E interaction for body weights for Kuchi chicken ecotype of Tanzania reared under intensive (on-station) and extensive (free-range) management systems. Body weight was assessed at 8 (Bwt8), 12(Bwt12), 16(Bwt16), and 20(Bwt20) weeks of age. Results for this study indicated average performance in all body weight measurements was significantly higher under intensive management compared to extensive management ($P < 0.001$), signifying two diverse environment and hence possibility for G x E interaction. Based on magnitude of genetic correlation for the same trait measured in two environments (*rg*) G x E interaction for all body weight measurements were found to be substantial (i.e. biologically important). Value for *rg* was 0.745, 0.757, 0.752 and 0.753 for Bwt8, Bwt12, Bwt16 and Bwt20, respectively. Since breeding program for improving performance of the ecotype would be more feasible under intensive management and hence more likely to take place under such environment, based on results of this study, if such breeding program is to be implemented, sensitization of smallholder farmers (beneficiaries of the breeding program) to shift from their current system of management (extensive management) to at least semiintensive system of management is recommended for minimizing the effect of G x E interaction.

Keywords : *Breed, environment, local chickens, performance.*

GJSFR-D Classification : *FOR Code: 070203, 070202, 070204*

Strictly as per the compliance and regulations of:

Genotype-Environmental (G X E) Interaction for Body Weights for *Kuchi* Chicken Ecotype of Tanzania Reared Under Intensive and Extensive Management

J. Lwelamira

Abstract - This study was carried out with the aim of determining magnitude of G x E interaction for body weights for *Kuchi* chicken ecotype of Tanzania reared under intensive (on-station) and extensive (free-range) management systems. Body weight was assessed at 8 (Bwt8), 12(Bwt12), 16(Bwt16), and 20(Bwt20) weeks of age. Results for this study indicated average performance in all body weight measurements was significantly higher under intensive management compared to extensive management (P< 0.001), signifying two diverse environment and hence possibility for G x E interaction. Based on magnitude of genetic correlation for the same trait measured in two environments (r_g) G x E interaction for all body weight measurements were found to be substantial (i.e. biologically important). Value for r_g was 0.745, 0.757, 0.752 and 0.753 for Bwt8, Bwt12, Bwt16 and Bwt20, respectively. Since breeding program for improving performance of the ecotype would be more feasible under intensive management and hence more likely to take place under such environment, based on results of this study, if such breeding program is to be implemented, sensitization of smallholder farmers (beneficiaries of the breeding program) to shift from their current system of management (extensive management) to at least semi- intensive system of management is recommended for minimizing the effect of G x E interaction.

Keywords : Breed, environment, local chickens, performance.

I. Introduction

Indigenous (local) chickens account for majority of chicken population in developing world including Tanzania. These chickens are mostly kept under extensive management in rural areas. Studies have shown at least 80% of rural households of Sub- Saharan Africa keep local chickens (Aini, 1990; Msoffe, 2003; Illango *et al.*, 2005; Dana *et al.*, 2011). Although the sector have been contributing substantially to household income and nutrition for majority of poor rural communities (Pedersen, 2002; Aganga *et al.*, 2003; Muchadeyi *et al.*, 2005; 2007; Alabi *et al.*, 2006), however, its expansion has been limited by low productivity. Poor management practices, high prevalence of diseases and low genetic potential of the stock have been the main factors associated with low productivity of the sector (Pedersen, 2002; Magwisha *et al.*, 2002; Rosa dos Anjos, 2005; Lwelamira, 2007). Therefore, among others, for improving performance of local chickens and hence improved productivity of the sector, interventions to improve their genetic potential through appropriate breeding programs are inevitable. Breeding programs involving selection within local chicken stocks have been suggested as the best way of improving their genetic potential. This approach would offset some weaknesses encountered in other genetic improvement approaches (i.e. crossbreeding with exotic chickens). Some of these weaknesses include reduced broodiness and survival rate (Tadelle *et al.*, 2000; Udo *et al.* 2001; Dana, 2011). Furthermore, selection within local chicken stocks would also enhance conservation of indigenous genetic resources, a current global move (Kosgey, 2004; Msoffe, 2003, Lwelamira, 2007; Dana, 2011). Successful selective breeding program requires sufficiently large population, pedigree recording, accurate measurement of individual performance and the capacity to minimize environmental variation (Besbes, 2009). These conditions can hardly be met under smallholder farmers' conditions in tropics. Accurate record keeping by smallholder farmers in tropics have proven to be difficult due to involvement of smallholder farmers in many farm activities and hence less time for recording, and complexity of recording process (Kiwuwa, 1992; Jaitner *et al.*, 2001; Wollny *et al.*, 2002; Lwelamira, 2007). Therefore, selective breeding program for improving genetic potential of local chickens is more likely to take place under central breeding station (Intensive management). However, since management under station would definitely be different from extensive management (under smallholder farmers conditions i.e. on-farm) where improved genetic stock is going to perform, this may result into Genotype by Environment Interaction (G x E). Magnitude of G x E need to be quantified (known) to determine whether it would have a significant effect on the performance of the birds and hence its biological importance. This is the birds and hence its biological importance. This is through estimation of genetic correlation between the same trait measured in two environments (Falconer, 1952; Robertson, 1959; Sorensen, 1977; Falconer and Mckay, 1996; Calus *et al.*, 2002; Mulder and Bijma,

Author : Institute of Rural Development Planning, P.O. BOX 138, Dodoma, Tanzania. E - mail: jlwelamira@yahoo.com

2005; Nauta, 2009). Knowing the magnitude of G x E problem under particular situation would help in determining whether strategies to reduce the problem are necessary. Results from random samples of mature birds from rural areas of Tanzania done in previous studies (Lawrence, 1998) as well as growth studies under both extensive and intensive management for some Tanzania local chickens (Msoffe, 2003; Lwelamira *et al*., 2008; 2009) indicated *Kuchi* to be superior to other ecotypes in terms of body weight and growth rate hence good starting material for developing meat chickens for production under extensive management. Therefore, in this regard, this study aimed at determining the magnitude of G x E interaction for *Kuchi* chicken ecotype of Tanzania kept under both intensive (station) and extensive/on- farm management (i.e. under smallholder farmers conditions). This would help in determining whether strategies to reduce the problem of G x E interaction are required during genetic improvement of *Kuchi* chicken ecotype through selection.

II. Materials and Methods

a) Study site and experimental materials

This study was carried out at Sokoine University of Agriculture (SUA) poultry research unit, Morogoro, Tanzania and two nearby villages (i.e. *Kauzeni* and *Mgambazi*). The place is located at an altitude of about 525m, above sea level. The relative humidity at the location is about 81%, while the monthly mean and maximum temperatures are 18.7 and 30.1° C, respectively. The area has annual mean rainfall of 846mm. Experimental chicks were derived from parental stock for *Kuchi* chicken ecotype obtained from drier parts of North West Tanzania.

b) Mating, hatching and management of experimental materials on-station

Twenty four (24) cocks were mated to 175 hens with number of hens per cock ranging from 5 to 8 with average of 7. (All birds were wing tagged for identification/ for keeping pedigree). Before mating, hens were rested without a cock for a period of three weeks in order to ensure that upon mating, a known/planned cock has fertilized the eggs. Mating was done repeatedly after every one week with mating and egg collection period lasting for three days and one week, respectively in each cycle. After every mating, transferring of hens to individual battery cages was done with the purpose of identifying and marking the eggs from each hen before incubation in order to keep track on pedigree. A total of 645 chicks were produced in eleven hatches. Upon hatching, not all hens possessed chicks, therefore the chicks above were the progeny of 163 hens. Hatched chicks were wing tagged and housed in floor pens up to 12 weeks of age. Thereafter they were transferred to individual cages. Birds were fed a starter ration (20% CP and 2800 Kcal ME/kg) from day old to 8th week of age, growers ration (16% CP and 2750 Kcal ME/kg) from 9th to 16th week of age, and layers ration (17%CP and 2700 Kcal ME/kg) from 17th week of the age to the rest of the period. Parent stock was also fed the same layers ration. Water was supplied on ad libitum basis. Birds were also vaccinated routinely against Gumboro and Newcastle disease (ND).

c) Mating, hatching and management of experimental materials on-farm

After the end of mating and hatching period in on-station experiment, the parent stock (with birds still with their wing tags for identification) was taken to the field for on-farm experiment. A total of 146 hens and 22 cocks for *Kuchi* chicken ecotype were supplied to 68 farmers, that is, 30 and 38 farmers from *Mgambazi* and *Kauzeni* villages, respectively. Each farmer was given 2 to 3 hens. Criteria for the choice of the farmers were based on the willingness of a farmers to participate in construction of a chicken house, which could accommodate at least 3 adult *Kuchi* birds on individual compartments, and to participate in a training (a three day training) on how experimental birds should be managed and willing to adopt that management system. The building materials for construction of chicken houses were supplied by the Enhancement of Health and Productivity of Smallholder Livestock in East Africa (PHSL) project. A farmer only contributed a space for building a chicken house around his/her homestead and labour.

Parent stock kept at Sokoine University of Agriculture, Poutry Research Unit, was vaccinated against ND and Gumboro two weeks and one week, respectively before being taken to the field. Furthermore, while in poultry research unit at the University waiting to be taken to the field, hens were kept separately from cocks for a period of three weeks to avoid mating before experiment (To avoid fertilization of egg by unplanned cock during on-farm experiment). Initially each farmer was supplied with two hens for *Kuchi* chicken ecotype, however due to fertility problems some farmers (few) were given up to 3 hens. Upon arrival to the field, hens were placed in individual compartments and each hen was mated to a specific cock while in individual compartments (that is, hens were not allowed to go out to mate with other unplanned cocks). Three to four nearby farmers were supplied with one cock for the ecotype and these farmers were sharing the cock for mating their hens. Each farmer was staying with a breeding cock for 3 to 4 days and passes it on to another farmer. Furthermore, hens were also let to lay, incubate and hatch their eggs while in individual compartments. Confinement of hens in individual compartments during mating up to hatching was done to avoid mix-up of cocks. This was done with the help of field supervisors (two field supervisors per village).

Tasks of field supervisors were recording, medication, vaccination, tagging of birds, that is, newly hatched chicks and ensuring that birds are managed by farmers according the protocol of the experiment. During mating, incubation and hatching periods, birds were supplied with water and layers ration (17% CP and 2700 Kcal ME/kg) on *ad libitum* basis. At this period parent stocks were also given antihelmintics (*Kukuzole*®) and broad spectrum antibiotics (*OTC-plus*®) regularly (prophylactic treatments) according to manufacturer instructions, and their bodies/houses were dusted with pesticides (*Dudu-dust*®) to control external parasites. Feeds and medications were supplied by the project. A total of 554 chicks were hatched. Hatching was done in a period extending from Mid- April, 2005 to Early August, 2005. After hatching chicks were tagged and hens continued to stay in confinement with their chicks for a period of ten days. While in confinement birds were fed chick starter ration (20% CP and 2800 Kcal ME/kg). The purpose of confining chicks in the early days of their lives was to minimize mortalities due to predation. After the end of confinement period birds were freed and chicks left to move out (scavenging) with their mothers. At this stage birds were depending entirely on scavenging feed. Due to fertility problems, not all hens supplied to farmers possessed chicks. Therefore the above chicks were progeny of 101 hens. The vaccination regimes for chicks were as in the on-station.

d) Traits studied

Body weights measured in grams were recorded on all individuals at 8, 12, 16 and 20 weeks of age (i.e. Bwt8, Bwt12, Bwt16, and Bwt20, respectively). However, due to mortalities, about 596, 593, 586 and 580 chicks on-station ; and 404, 392, 382 and 373 chicks on- farm were available for weighing at 8, 12, 16 and 20 weeks of age respectively.

e) Statistical analysis

i. *Descriptive statistics*

Descriptive statistics were generated using the SAS (2000) General Linear Models (GLM) procedure.

ii. *Estimation of genetic correlation between the same trait measured in two environments*

Genetic correlation for the same trait measured in two environments was estimated using equation 1 proposed by Robertson (1959) as applied by Sørensen (1977).

$$\sigma^2_{SxE} = \frac{\sigma_{A1} - \sigma_{A2}}{2} + \sigma_{A1} .\sigma_{A2} .\left(1 - r_g\right)$$

Equation 1

Where, $\sigma^2_{S\times E}$ = Sire by environment interaction component of variance;

σ_{A1} = square root of additive genetic variation in environment 1;

σ_{A2} = square root of additive genetic variation in environment 2;

r_g = genetic correlation between the same trait measured in two environments.

The interaction component of variance was estimated using MIXED procedure of SAS (2000) using statistical model 1. (The same model was also used to test the fixed effect of sex and environment). Additive genetic variances in respective environments were estimated based on sire components of variances as per Falconer and Mckay (1996). MIXED procedures of SAS (2000) were also used to estimate sire components of variances using statistical model 2. Only sires (cocks) (about 22 sires) with chicks both on- station and on-farm were involved in this analysis. Before analyses data were adjusted for significant effect of other fixed factors such as hatch (on-station environment), hatching month and farm (on-farm environment) using GLM procedures of SAS (2000).

$$Y_{ijkl} = \mu + C_i + E_j + S_k + (ES)_{jk} + e_{ijkl} \ldots$$ Model 1

Where:

Y_{ijkl} = record of l^{th} individual from i^{th} sex, j^{th} environment, and k^{th} sire;

μ = overall mean;

C_i = fixed effect of i^{th} sex;

E_j = fixed effect of j^{th} environment;

S_k = random effect of k^{th} sire, *NID* $(0, \sigma_s^2)$;

$(ES)_{jk}$ = random interaction effect of sire and environment;

e_{ijkl} = random effect peculiar to each individual distributed as *NID*$(0, \sigma_e^2)$.

$$Y_{ijk} = \mu + C_i + S_j + e_{ijk}$$ Model 2

Where:

Y_{ijkl} = record of k^{th} individual from i^{th} sex and j^{th} sire;

μ = overall mean;

C_i = fixed effect of i^{th} sex;

S_j = random effect of j^{th} sire, *NID* $(0, \sigma_s^2)$;

e_{ijk} = random effect peculiar to each individual distributed as *NID*$(0, \sigma_e^2)$.

III. Results and Discussion

a) Body weights for the ecotype under intensive and extensive management

Results from Table 1 indicate average body weights under intensive management were higher than those under extensive management, implying higher growth rate under intensive management compared to extensive management. Body weights under extensive management were around 70% of the correspondent body weights under intensive management. These differences in performance between the two environments were statistically significant (P< 0.0001) (Table 2). Relatively lower average weight under

extensive management, a system used by majority of smallholder farmers in tropics (Aini, 1990; Msoffe, 2003; Muchadeyi *et al*., 2005; Lwelamira, 2007), reflects sub-optimal conditions to support production under such system. Studies elsewhere in tropics have indicated nutrient deficiency and prevalence of diseases under extensive (free range) system of management to be high, a condition which contribute heavily to poor performance of chickens under such system (Magwisha *et al*., 2002; Hørning *et al*., 2003; Otim, 2005; Rosa dos Anjos, 2005; Goromela *et al*., 2006). Significant differences in these two environments on the performance of the ecotype can lead to G X E interaction (Tolon and Yalcin, 1997; Sørensen, 1999; Maniatis and Pollot, 2002; N'dri et al., 2007). However, magnitudes of G x E interaction in the studied traits need to be quantified to determine its importance (Falconer, 1952; Robertson, 1959; Sorensen, 1977; Calus *et al*., 2002; Mulder and Bijma, 2005; Nauta, 2009; Ibi et al., 2005; Nauta, 2009) and hence implication for breeding schemes for this ecotype.

Table 1: Lsmeans for body weights under intensive and extensive management

Sex	Trait	Intensive management		Extensive management	
		N	Lsmeans (s.e)	N	Lsmeans (s.e)
M	Bwt8 (g)	279	541 (3.2)	201	375(3.9)
	Bwt12 (g)	278	1026 (5.8)	195	739 (7.4)
	Bwt16 (g)	274	1449 (6.1)	190	1024 (9.4)
	Bwt20 (g)	270	1706 (6.9)	186	1240 (10.2)
F	Bwt8 (g)	317	438 (2.5)	203	320 (3.5)
	Bwt12 (g)	315	883 (5.6)	197	632 (7.2)
	Bwt16 (g)	312	1339 (5.9)	192	925 (8.3)
	Bwt20 (g)	310	1587 (6.2)	187	1135 (9.6)

Lsmeans= Least square means; s.e = standard error; M and F = Males and females, respectively; Bwt8, Bwt12, Bwt16, and Bwt20= Body weight at 8, 12, 16, and 20 weeks of age, respectively.

Table 2: Type 3 Tests of fixed effects for body weights

Trait	Effect	DF	F value	P- value
Bwt8	Environment	1	257	< 0.0001
	Sex	1	337	< 0.0001
Bwt12	Environment	1	599	< 0.0001
	Sex	1	410	< 0.0001
Bwt16	Environment	1	630	< 0.0001
	Sex	1	282	< 0.0001
Bwt20	Environment	1	710	< 0.0001
	Sex	1	290	< 0.0001

Bwt8, Bwt12, Bwt16, and Bwt20= Body weight at 8, 12, 16, and 20 weeks of age, respectively

b) Genetic correlation between the same trait measured in two environments

To quantify Genotype- Environment (G x E) Interactions for studied traits in order to determine whether they are biologically important or not (Falconer, 1952; Robertson, 1959; Falconer and Mckay, 1996 ; Calus *et al*., 2002; Sorensen, 1977, Mulder and Bijma, 2005), genetic correlation of the same trait measured in two environments (Intensive vs extensive management) were estimated for all body weight measurements under study. Results are presented in Table 3. Results indicate genetic correlation for the same trait measured under intensive and extensive management (i.e. on-station vs on-farm) varied from 0.745 to 0.757. According to Robertson (1959), Falconer (1952) and Mulder and Bijma (2005) classifications, in which a value of genetic correlation equal to or above 0.80 (i.e ≥ 0.80) is considered to have no substantial/biologically important G x E interactions, genetic correlations obtained in this study indicate substantial G x E interactions for all body weight measurements. Significant G x E interactions for body weights were also reported by several authors in broilers. Sørensen (1977) reported a genetic correlation for body weight at 5 weeks of age for broilers under high and low protein diets to be 0.33. Similarly, in an experiment by Pakdel (2004) studying the effect of cold stress on Ascites (a disease associated with high growth rates in broilers) in broilers reported a genetic correlation between body weight at 6 weeks of age for broilers measured under normal and cold stress to be 0.56. Substantial G x E interaction were also reported for egg production and related traits by Mukherjee (1980) in egg type chickens evaluated in Berlin, Germany (Temperate climate) and Kuala Lumpur, Malaysia (Tropical environment) with genetic correlations between the same trait in the two environments ranged from 0.41 to 0.64. The existence of significant G x E interaction for the same trait measured in two environments indicates that different sets of genes and involved in the expression of the traits in the two environments

(Sørensen, 1977; Hohenboken, 1985; Togashi *et al*., 2001; Lin and Togashi, 2002; Mulder and Bijma, 2005; Charo-Karisa, 2006). Hence improvement obtained in one environment would not be fully realized in another environment where G x E interaction is significant.

Majority of poultry farmers in the country are smallholder farmers rearing their chickens under extensive management (Msoffe, 2003; Lwelamira, 2007). Since G x E interactions for body weights for *Kuchi* chicken ecotype obtained in this study were substantial, this suggest that selection for improving performance of *Kuchi* chicken ecotype for use by farmers should be carried out under extensive management to counteract effect of G x E (Sorensen, 1999; Mulder and Bijma, 2005; Charo- Karisa, 2006; Lwelamira, 2007; Nauta, 2009). However, such breeding program can be expensive and difficult to implement as it would require close supervision in recording and mating processes. The need for large pedigreed population together with the need to minimize environmental variations if selective breeding program is to be implemented (Besbes, 2009), conditions which can hardly be met under smallholder farmers' conditions in tropics are another obstacles for implementing such programs under extensive/ smallholder farmers' condition. Farmers under smallholder conditions are usually occupied with many tasks/activities and hence accurate record keeping under such conditions has proven to be difficult due to lack of time by smallholder farmers. Other factors include ignorance and complexity of recording process (Kiwuwa, 1992; Jaitner *et al*., 2001; Wollny *et al*., 2002; Kosgey, 2004; Lwelamira, 2007). Therefore, alternatively, selection for improving performance of *Kuchi* chicken ecotype can be carried out under intensive management (Central Breeding Station) and distribute selected stock to farmers (Two- tier breeding scheme with closed nucleus). However, farmers would be required to change their current system of management and practice at least semi- intensive system of management to minimize environmental differences and hence minimizing G x E interactions (Sorensen, 1999; Lwelamira, 2007).

Table 3 : Genetic correlations among body weights measured in two environments (i.e. on-station and on-farm management)

Trait	σ^2_{A1}	σ^2_{A2}	r_g
Bwt8	2524	2312	0.745
Bwt12	4341	4275	0.757
Bwt16	4956	5570	0.752
Bwt20	5005	5840	0.753

σ^2_{A1} = Additive genetic variance under intensive management (on- station); σ^2_{A2} = Additive genetic variance under extensive management (on-farm); r_g = Genetic correlation for the same trait measured in the two environment; Bwt8, Bwt12, Bwt16, and Bwt20 = Body weight at 8, 12, 16, and 20 weeks of age, respectively.

IV. Conclusion and Reccomendations

Results for this study indicated substantial G x E interactions for all body weight measurements for *Kuchi* chicken ecotype for two environments under study (on-station and on-farm). Since breeding program for improving performance of the ecotype would be more feasible under on-station (intensive management) and hence more likely to take place on-station, therefore, if such breeding program is to be implemented, sensitization of smallholder farmers (beneficiaries of the breeding program) to shift from their current system of management (extensive management) to at least semi intensive system of management would be inevitable as this would minimize the effect of G x E interaction.

V. Acknowledgements

The work presented here was part of PhD work by the author. Financial support to the study by DANIDA through Production and Health of Smallholder Livestock (PHSL) project is highly appreciated.

References Références Referencias

1. Aini, I., 1990. Indigenous chicken production in South-east Asia. World's Poult. Sci. J., 46: 51-57.
2. Alabi, R.A., A.O. Esobhawan and M.B. Aruna, 2006. Econometric determination of contribution of family poultry to women's income in Niger-delta, Nigeria. J. of Central Europ. Agric.,7:753-760.
3. Besbes, B., 2009. Genotype evaluation and breeding of poultry for performance under suboptimal village conditions, World's Poult. Sci. J., 65: 260–271
4. Calus, M.P.L., A.F. Groen and G. De Jong, 2002. Genotype x environment interaction for protein yield in Dutch dairy cattle as quantified by different models. J. Dairy Sci., 85:3115-3123.
5. Charo-Karisa, H., 2006. Selection for growth of Nile Tilapia (*Oreochromis niloticus* L.) in low input environments. PhD Thesis. Wageningen University, Wageningen, The Netherlands. 176pp.
6. Dana, N., 2011. Breeding programs for indigenous chicken in Ethiopia. Analysis of diversity in production systems and chicken populations. PhD thesis, Wageningen University, The Netherlands. 148pp.
7. Dana, N., E.H. van der Waaij and J.A.M. van Arendon, 2011. Genetic and phenotypic parameter estimates for body weights and egg production in Horro chicken of Ethiopia. Trop. Anim. Health Prod., 43:21–28.
8. Falconer, D. S., 1952. The problem of environment and selection. Am. Nat., 86(830): 293-298.

9. Falconer, D.S and T.F.C. Mackay, 1996. Introduction to Quantitative Genetics. 4th Ed. Longman, London, UK
10. Goromela, E.H., R.P. Kwakkel, M.W.A. Verstegen, and A.M. Katule, 2006. Strategies to optimize the use of scavengeable feed resource base by smallholders in traditional poultry production systems in Africa: A review. African J. of Agric. Res. 1 (3): 91-100.
11. Hohenboken, W.D., 1985. Genotype x Environment Interaction. In: *World Animal Science, A basic Information*: *General and Quantitative Genetics* (Edited by Chapman, A.B), Elsevier Science Publishing Company Inc. NY. pp 151-163.
12. Hørning, G., Rasmussen, S., Permin, A. and Bisgaard, M. (2003). Investigations on the Influence of Helminth Parasites on Vaccination of Chickens against Newcastle Disease Virus under Village Conditions. Trop. Anim. Health and Prod., 35(5): 415 – 424.
13. Ibi, T., H. Hirooka, A. K. Kahi, Y. Sasae and Y. Sasaki, 2005. Genotype x environmental interaction effects on carcass traits in Japanese Black cattle. J. Anim. Sci., 83:1503-1510.
14. Illango, J., W. Olaho-Mukani, G. Mukiibi-Muka, P.P. Abila and A. Etoori, 2005. Immunogenecity of a locally produced Newcastle disease I-2 thermostable vaccine in chickens in Uganda. Trop. Anim. Health. and Prod., 37: 25-31.
15. Jaitner, J., J. Sawe, E. Secka-Njie, L. Dempfe, 2001. Ownership pattern and management practices of small ruminants in The Gambia – Implication for breeding programme. Small rumin. Res., 40: 101 - 108.
16. Kiwuwa, G.H., 1992. Breeding strategies for small ruminant productivity in Africa. In. Rey, B, Lebbie, S.H.B, Reynolds, L (Eds). Small ruminant research and development in Africa, Proceeding of the First Biennial Conference of the Africa Small Ruminants Research Network, ILRAD, Nairobi, Kenya, 10-14 December,1990, pp. 423 -434.
17. Kosgey, I. S., 2004. Breeding objectives and breeding strategies of small ruminants in tropics. PhD thesis, Wageningen University, The Netherlands. 272pp.
18. Lawrence, P.M.M., 1998. Ecotypes and natural disease resistance among scavenging local chickens of Tanzania. M.Sc. thesis. The Royal Veterinary and Agricultural University (RVAU), Copenhagen, Denmark. 97pp.
19. Lin, C.Y. and K. Togashi, 2002. Genetic improvement in the presence of genotype by environment interaction. Anim. Sci. J., 73: 3-11.
20. Lwelamira, J., 2007. Prospects for improving performance among two local chicken ecotypes of Tanzania through selection. PhD thesis, Sokoine University of Agriculture, Morogoro, Tanzania, 204pp. Lwelamira, J., G.C. Kifaro and P.S. Gwakisa 2008.
21. On station and on-farm evaluation of two Tanzania chicken ecotypes for body weights at different ages and for egg production. African J. of Agric. Res., 3 (12): 843-851.
Lwelamira, J., G.C. Kifaro and P.S. Gwakisa, 2009.
22. Genetic parameters for body weights, egg traits and antibody response against Newcastle Disease Virus (NDV) vaccine among two Tanzania chicken ecotypes, Trop. Anim. Health and Prod., 41: 51–59.
23. Magwisha, H.B., A.A. Kassuku, A.A, N.C. Kyvsgaard and A. Permin, 2002. A comparison of the prevalence and burdens of helminth infections in growers and adult free-range chickens. Trop. Anim. Health and Prod., 34 (3): 205 – 214.
24. Maniatis, N and G. E. Pollott, 2002. Genotype by environment interactions in lamb weight and carcass composition traits. Anim. Sci., 75: 3-14.
25. Msoffe, P.M.M., 2003. Diversity among local chicken ecotypes in Tanzania. PhD Thesis. Sokoine University of Agriculture, Morogoro, Tanzania, 223pp.
26. Muchadeyi, F.C., C.B.A. Wollny, H. Eding, S.Weigend, S.M. Makuza and Simianer, H., 2007. Variation in village chicken production systems among agro-ecological zones of Zimbabwe. Trop. Anim. Health and Prod., 39: 453-461.
27. Muchadeyi, F.C., S. Sibanda, N.T. Kusina, J.F. Kusina, J.F. and S.M. Makuza, 2005. Village chicken flock dynamics and contribution of chickens to household livelihoods in smallholder farming area in Zimbabwe. Tropic. Anim. Health and Prod., 37 (4): 333-344
28. Mukherjee, T.K., P. Horst, D.K. Flock and J. Petersen, 1980. Sire x location interactions from progeny tests in different countries. *British Poultry Science* 21: 123-129.
29. Mulder, H.A. and Bijma, P, 2005. Effect of genotype x environment interactions on genetic gain in breeding programs. J. of Anim. Sci., 83: 49-61.
30. N'dri, A.L., N. Sellier, M. Tixier- Boichard, C. Beaumont, S. Mignon- Grasteau, 2007. Genotype by environment interactions in relation to growth traits in slow growing chickens. Gen. Sel. Evol. 39: 513–528
31. Nauta, W.J., 2009. Selective Breeding in Organic Dairy Production. PhD thesis, Wageningen University, The Netherlands. 160pp.
32. Otim, M.O., 2005. Newcastle disease in village poultry: Molecular and phylogenetic studies of the virus and disease epidemiology. PhD thesis. The Royal Veterinary and agricultural University (RVAU), Copenhagen. Denmark. 140pp.
33. Pedersen, C.V., 2002. Productivity of semi-scavenging chickens in Zimbabwe. PhD Thesis. The Royal Veterinary and Agricultural University (RVAU), Copenhagen, Denmark. 133pp
34. Robertson, A., 1959. The sampling variance of the genetic correlation coefficient. Biometrics., 15: 469-485.

35. Rosa dos Anjos, F., 2005. Effect of scavenging feed resource base on prevalence of parasites and performance of chickens in Sussundenga District, Mozambique. M.Sc. Thesis. The Royal Veterinary and Agricultural University (RVAU), Copenhagen, Denmark. 81pp.
36. Statistical Analysis System (SAS). 2000. SAS/STAT Users' Guide, Release 6.12 Edition, SAS Institute Inc, Cary, North Carolina. USA.
37. Sørensen, P., 1977. Genotype- Level of protein interaction for growth rate in broilers. Bri. Poult. Sci., 18:625-632.
38. Sørensen, P., 1999. Interaction between breeds and environments.In: *Poultry as a tool in poverty eradication and promotion of gender equality*. Proceedings of a workshop, held on march, 22-26, 1999, Tune Landboskole, Denmark, pp 145-150.
39. Togashi, K., C.Y. Lin and K. Moribe, 2001. Construction of optimum index to maximize overall response across countries in the presence of Genotype x Environment interaction. J. of Dairy Sci., 84: 1872 – 1883.
40. Tolon, B. and S. Yalcin. 1997. Bone characteristics and body weight of broilers in different husbandry systems. Br. Poult. Sci. 38:132-135.
41. Wollny, C.B.A., J.W. Banda, T.F.T. Mlewah and R.K.D. Phoya, 2002. The lessons of livestock improvement failure: Revising breeding strategies for indigenous Malawi sheep?. In: Proceeding of the seventh World Congress on Genetics Applied to Livestock Production, Vol 3, Montpellier, France, 19 -23 August 2002, pp. 345- 348.

Global Journals Inc. (US) Guidelines Handbook 2012

www.GlobalJournals.org

FELLOW OF ASSOCIATION OF RESEARCH SOCIETY IN MEDICAL (FARSM)

- 'FARSM' title will be awarded to the person after approval of Editor-in-Chief and Editorial Board. The title 'FARSM" can be added to name in the following manner. eg. Dr. John E. Hall, Ph.D., FARSM or William Walldroff Ph. D., M.S., FARSM
- Being FARSM is a respectful honor. It authenticates your research activities. After becoming FARSM, you can use 'FARSM' title as you use your degree in suffix of your name. This will definitely will enhance and add up your name. You can use it on your Career Counseling Materials/CV/Resume/Visiting Card/Name Plate etc.
- 60% Discount will be provided to FARSM members for publishing research papers in Global Journals Inc., if our Editorial Board and Peer Reviewers accept the paper. For the life time, if you are author/co-author of any paper bill sent to you will automatically be discounted one by 60%
- FARSM will be given a renowned, secure, free professional email address with 100 GB of space eg.johnhall@globaljournals.org. You will be facilitated with Webmail, SpamAssassin, Email Forwarders, Auto-Responders, Email Delivery Route tracing, etc.
- FARSM member is eligible to become paid peer reviewer at Global Journals Inc. to earn up to 15% of realized author charges taken from author of respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account or to your PayPal account.
- Eg. If we had taken 420 USD from author, we can send 63 USD to your account.
- FARSM member can apply for free approval, grading and certification of some of their Educational and Institutional Degrees from Global Journals Inc. (US) and Open Association of Research,Society U.S.A.
- After you are FARSM. You can send us scanned copy of all of your documents. We will verify, grade and certify them within a month. It will be based on your academic records, quality of research papers published by you, and 50 more criteria. This is beneficial for your job interviews as recruiting organization need not just rely on you for authenticity and your unknown qualities, you would have authentic ranks of all of your documents. Our scale is unique worldwide.
- FARSM member can proceed to get benefits of free research podcasting in Global Research Radio with their research documents, slides and online movies.
- After your publication anywhere in the world, you can upload you research paper with your recorded voice or you can use our professional RJs to record your paper their voice. We can also stream your conference videos and display your slides online.
- FARSM will be eligible for free application of Standardization of their Researches by Open Scientific Standards. Standardization is next step and level after publishing in a journal. A team

of research and professional will work with you to take your research to its next level, which is worldwide open standardization.

- FARSM is eligible to earn from their researches: While publishing his paper with Global Journals Inc. (US), FARSM can decide whether he/she would like to publish his/her research in closed manner. When readers will buy that individual research paper for reading, 80% of its earning by Global Journals Inc. (US) will be transferred to FARSM member's bank account after certain threshold balance. There is no time limit for collection. FARSM member can decide its price and we can help in decision.

MEMBER OF ASSOCIATION OF RESEARCH SOCIETY IN MEDICAL (MARSM)

- 'MARSM' title will be awarded to the person after approval of Editor-in-Chief and Editorial Board. The title 'MARSM" can be added to name in the following manner. eg. Dr. John E. Hall, Ph.D., MARSM or William Walldroff Ph. D., M.S., MARSM
- Being MARSM is a respectful honor. It authenticates your research activities. After becoming MARSM, you can use 'MARSM' title as you use your degree in suffix of your name. This will definitely will enhance and add up your name. You can use it on your Career Counseling Materials/CV/Resume/Visiting Card/Name Plate etc.
- 40% Discount will be provided to MARSM members for publishing research papers in Global Journals Inc., if our Editorial Board and Peer Reviewers accept the paper. For the life time, if you are author/co-author of any paper bill sent to you will automatically be discounted one by 60%
- MARSM will be given a renowned, secure, free professional email address with 30 GB of space eg.johnhall@globaljournals.org. You will be facilitated with Webmail, SpamAssassin, Email Forwarders, Auto-Responders, Email Delivery Route tracing, etc.
- MARSM member is eligible to become paid peer reviewer at Global Journals Inc. to earn up to 10% of realized author charges taken from author of respective paper. After reviewing 5 or more papers you can request to transfer the amount to your bank account or to your PayPal account.
- MARSM member can apply for free approval, grading and certification of some of their Educational and Institutional Degrees from Global Journals Inc. (US) and Open Association of Research,Society U.S.A.
- MARSM is eligible to earn from their researches: While publishing his paper with Global Journals Inc. (US), MARSM can decide whether he/she would like to publish his/her research in closed manner. When readers will buy that individual research paper for reading, 40% of its earning by Global Journals Inc. (US) will be transferred to MARSM member's bank account after certain threshold balance. There is no time limit for collection. MARSM member can decide its price and we can help in decision.

AUXILIARY MEMBERSHIPS

ANNUAL MEMBER

- Annual Member will be authorized to receive e-Journal GJMR for one year (subscription for one year).
- The member will be allotted free 1 GB Web-space along with subDomain to contribute and participate in our activities.
- A professional email address will be allotted free 500 MB email space.

PAPER PUBLICATION

- The members can publish paper once. The paper will be sent to two-peer reviewer. The paper will be published after the acceptance of peer reviewers and Editorial Board.

Process of submission of Research Paper

The Area or field of specialization may or may not be of any category as mentioned in 'Scope of Journal' menu of the GlobalJournals.org website. There are 37 Research Journal categorized with Six parental Journals GJCST, GJMR, GJRE, GJMBR, GJSFR, GJHSS. For Authors should prefer the mentioned categories. There are three widely used systems UDC, DDC and LCC. The details are available as 'Knowledge Abstract' at Home page. The major advantage of this coding is that, the research work will be exposed to and shared with all over the world as we are being abstracted and indexed worldwide.

The paper should be in proper format. The format can be downloaded from first page of 'Author Guideline' Menu. The Author is expected to follow the general rules as mentioned in this menu. The paper should be written in MS-Word Format (*.DOC,*.DOCX).

The Author can submit the paper either online or offline. The authors should prefer online submission.Online Submission: There are three ways to submit your paper:

(A) (I) First, register yourself using top right corner of Home page then Login. If you are already registered, then login using your username and password.

(II) Choose corresponding Journal.

(III) Click 'Submit Manuscript'. Fill required information and Upload the paper.

(B) If you are using Internet Explorer, then Direct Submission through Homepage is also available.

(C) If these two are not convenient, and then email the paper directly to dean@globaljournals.org.

Offline Submission: Author can send the typed form of paper by Post. However, online submission should be preferred.

Preferred Author Guidelines

MANUSCRIPT STYLE INSTRUCTION (Must be strictly followed)

Page Size: 8.27" X 11'"

- Left Margin: 0.65
- Right Margin: 0.65
- Top Margin: 0.75
- Bottom Margin: 0.75
- Font type of all text should be Swis 721 Lt BT.
- Paper Title should be of Font Size 24 with one Column section.
- Author Name in Font Size of 11 with one column as of Title.
- Abstract Font size of 9 Bold, "Abstract" word in Italic Bold.
- Main Text: Font size 10 with justified two columns section
- Two Column with Equal Column with of 3.38 and Gaping of .2
- First Character must be three lines Drop capped.
- Paragraph before Spacing of 1 pt and After of 0 pt.
- Line Spacing of 1 pt
- Large Images must be in One Column
- Numbering of First Main Headings (Heading 1) must be in Roman Letters, Capital Letter, and Font Size of 10.
- Numbering of Second Main Headings (Heading 2) must be in Alphabets, Italic, and Font Size of 10.

You can use your own standard format also.
Author Guidelines:

1. General,

2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

1. GENERAL

Before submitting your research paper, one is advised to go through the details as mentioned in following heads. It will be beneficial, while peer reviewer justify your paper for publication.

Scope

The Global Journals Inc. (US) welcome the submission of original paper, review paper, survey article relevant to the all the streams of Philosophy and knowledge. The Global Journals Inc. (US) is parental platform for Global Journal of Computer Science and Technology, Researches in Engineering, Medical Research, Science Frontier Research, Human Social Science, Management, and Business organization. The choice of specific field can be done otherwise as following in Abstracting and Indexing Page on this Website. As the all Global

Journals Inc. (US) are being abstracted and indexed (in process) by most of the reputed organizations. Topics of only narrow interest will not be accepted unless they have wider potential or consequences.

2. ETHICAL GUIDELINES

Authors should follow the ethical guidelines as mentioned below for publication of research paper and research activities.

Papers are accepted on strict understanding that the material in whole or in part has not been, nor is being, considered for publication elsewhere. If the paper once accepted by Global Journals Inc. (US) and Editorial Board, will become the copyright of the Global Journals Inc. (US).

Authorship: The authors and coauthors should have active contribution to conception design, analysis and interpretation of findings. They should critically review the contents and drafting of the paper. All should approve the final version of the paper before submission

The Global Journals Inc. (US) follows the definition of authorship set up by the Global Academy of Research and Development. According to the Global Academy of R&D authorship, criteria must be based on:

1) Substantial contributions to conception and acquisition of data, analysis and interpretation of the findings.

2) Drafting the paper and revising it critically regarding important academic content.

3) Final approval of the version of the paper to be published.

All authors should have been credited according to their appropriate contribution in research activity and preparing paper. Contributors who do not match the criteria as authors may be mentioned under Acknowledgement.

Acknowledgements: Contributors to the research other than authors credited should be mentioned under acknowledgement. The specifications of the source of funding for the research if appropriate can be included. Suppliers of resources may be mentioned along with address.

Appeal of Decision: The Editorial Board's decision on publication of the paper is final and cannot be appealed elsewhere.

Permissions: It is the author's responsibility to have prior permission if all or parts of earlier published illustrations are used in this paper.

Please mention proper reference and appropriate acknowledgements wherever expected.

If all or parts of previously published illustrations are used, permission must be taken from the copyright holder concerned. It is the author's responsibility to take these in writing.

Approval for reproduction/modification of any information (including figures and tables) published elsewhere must be obtained by the authors/copyright holders before submission of the manuscript. Contributors (Authors) are responsible for any copyright fee involved.

3. SUBMISSION OF MANUSCRIPTS

Manuscripts should be uploaded via this online submission page. The online submission is most efficient method for submission of papers, as it enables rapid distribution of manuscripts and consequently speeds up the review procedure. It also enables authors to know the status of their own manuscripts by emailing us. Complete instructions for submitting a paper is available below.

Manuscript submission is a systematic procedure and little preparation is required beyond having all parts of your manuscript in a given format and a computer with an Internet connection and a Web browser. Full help and instructions are provided on-screen. As an author, you will be prompted for login and manuscript details as Field of Paper and then to upload your manuscript file(s) according to the instructions.

To avoid postal delays, all transaction is preferred by e-mail. A finished manuscript submission is confirmed by e-mail immediately and your paper enters the editorial process with no postal delays. When a conclusion is made about the publication of your paper by our Editorial Board, revisions can be submitted online with the same procedure, with an occasion to view and respond to all comments.

Complete support for both authors and co-author is provided.

4. MANUSCRIPT'S CATEGORY

Based on potential and nature, the manuscript can be categorized under the following heads:

Original research paper: Such papers are reports of high-level significant original research work.

Review papers: These are concise, significant but helpful and decisive topics for young researchers.

Research articles: These are handled with small investigation and applications

Research letters: The letters are small and concise comments on previously published matters.

5. STRUCTURE AND FORMAT OF MANUSCRIPT

The recommended size of original research paper is less than seven thousand words, review papers fewer than seven thousands words also.Preparation of research paper or how to write research paper, are major hurdle, while writing manuscript. The research articles and research letters should be fewer than three thousand words, the structure original research paper; sometime review paper should be as follows:

Papers: These are reports of significant research (typically less than 7000 words equivalent, including tables, figures, references), and comprise:

(a)Title should be relevant and commensurate with the theme of the paper.

(b) A brief Summary, "Abstract" (less than 150 words) containing the major results and conclusions.

(c) Up to ten keywords, that precisely identifies the paper's subject, purpose, and focus.

(d) An Introduction, giving necessary background excluding subheadings; objectives must be clearly declared.

(e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition; sources of information must be given and numerical methods must be specified by reference, unless non-standard.

(f) Results should be presented concisely, by well-designed tables and/or figures; the same data may not be used in both; suitable statistical data should be given. All data must be obtained with attention to numerical detail in the planning stage. As reproduced design has been recognized to be important to experiments for a considerable time, the Editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned un-refereed;

(g) Discussion should cover the implications and consequences, not just recapitulating the results; conclusions should be summarizing.

(h) Brief Acknowledgements.

(i) References in the proper form.

Authors should very cautiously consider the preparation of papers to ensure that they communicate efficiently. Papers are much more likely to be accepted, if they are cautiously designed and laid out, contain few or no errors, are summarizing, and be conventional to the approach and instructions. They will in addition, be published with much less delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and to make suggestions to improve briefness.

It is vital, that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

Format

Language: The language of publication is UK English. Authors, for whom English is a second language, must have their manuscript efficiently edited by an English-speaking person before submission to make sure that, the English is of high excellence. It is preferable, that manuscripts should be professionally edited.

Standard Usage, Abbreviations, and Units: Spelling and hyphenation should be conventional to The Concise Oxford English Dictionary. Statistics and measurements should at all times be given in figures, e.g. 16 min, except for when the number begins a sentence. When the number does not refer to a unit of measurement it should be spelt in full unless, it is 160 or greater.

Abbreviations supposed to be used carefully. The abbreviated name or expression is supposed to be cited in full at first usage, followed by the conventional abbreviation in parentheses.

Metric SI units are supposed to generally be used excluding where they conflict with current practice or are confusing. For illustration, 1.4 l rather than 1.4 × 10-3 m3, or 4 mm somewhat than 4 × 10-3 m. Chemical formula and solutions must identify the form used, e.g. anhydrous or hydrated, and the concentration must be in clearly defined units. Common species names should be followed by underlines at the first mention. For following use the generic name should be constricted to a single letter, if it is clear.

Structure

All manuscripts submitted to Global Journals Inc. (US), ought to include:

Title: The title page must carry an instructive title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) wherever the work was carried out. The full postal address in addition with the e-mail address of related author must be given. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining and indexing.

Abstract, used in Original Papers and Reviews:

Optimizing Abstract for Search Engines

Many researchers searching for information online will use search engines such as Google, Yahoo or similar. By optimizing your paper for search engines, you will amplify the chance of someone finding it. This in turn will make it more likely to be viewed and/or cited in a further work. Global Journals Inc. (US) have compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Key Words

A major linchpin in research work for the writing research paper is the keyword search, which one will employ to find both library and Internet resources.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy and planning a list of possible keywords and phrases to try.

Search engines for most searches, use Boolean searching, which is somewhat different from Internet searches. The Boolean search uses "operators," words (and, or, not, and near) that enable you to expand or narrow your affords. Tips for research paper while preparing research paper are very helpful guideline of research paper.

Choice of key words is first tool of tips to write research paper. Research paper writing is an art.A few tips for deciding as strategically as possible about keyword search:

- One should start brainstorming lists of possible keywords before even begin searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in research paper?" Then consider synonyms for the important words.
- It may take the discovery of only one relevant paper to let steer in the right keyword direction because in most databases, the keywords under which a research paper is abstracted are listed with the paper.
- One should avoid outdated words.

Keywords are the key that opens a door to research work sources. Keyword searching is an art in which researcher's skills are bound to improve with experience and time.

Numerical Methods: Numerical methods used should be clear and, where appropriate, supported by references.

Acknowledgements: Please make these as concise as possible.

References

References follow the Harvard scheme of referencing. References in the text should cite the authors' names followed by the time of their publication, unless there are three or more authors when simply the first author's name is quoted followed by et al. unpublished work has to only be cited where necessary, and only in the text. Copies of references in press in other journals have to be supplied with submitted typescripts. It is necessary that all citations and references be carefully checked before submission, as mistakes or omissions will cause delays.

References to information on the World Wide Web can be given, but only if the information is available without charge to readers on an official site. Wikipedia and Similar websites are not allowed where anyone can change the information. Authors will be asked to make available electronic copies of the cited information for inclusion on the Global Journals Inc. (US) homepage at the judgment of the Editorial Board.

The Editorial Board and Global Journals Inc. (US) recommend that, citation of online-published papers and other material should be done via a DOI (digital object identifier). If an author cites anything, which does not have a DOI, they run the risk of the cited material not being noticeable.

The Editorial Board and Global Journals Inc. (US) recommend the use of a tool such as Reference Manager for reference management and formatting.

Tables, Figures and Figure Legends

Tables: Tables should be few in number, cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g. Table 4, a self-explanatory caption and be on a separate sheet. Vertical lines should not be used.

Figures: Figures are supposed to be submitted as separate files. Always take in a citation in the text for each figure using Arabic numbers, e.g. Fig. 4. Artwork must be submitted online in electronic form by e-mailing them.

Preparation of Electronic Figures for Publication

Even though low quality images are sufficient for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit (or e-mail) EPS (line art) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings) in relation to the imitation size. Please give the data for figures in black and white or submit a Color Work Agreement Form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution (at final image size) ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs) : >350 dpi; figures containing both halftone and line images: >650 dpi.

Color Charges: It is the rule of the Global Journals Inc. (US) for authors to pay the full cost for the reproduction of their color artwork. Hence, please note that, if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a color work agreement form before your paper can be published.

Figure Legends: Self-explanatory legends of all figures should be incorporated separately under the heading 'Legends to Figures'. In the full-text online edition of the journal, figure legends may possibly be truncated in abbreviated links to the full screen version. Therefore, the first 100 characters of any legend should notify the reader, about the key aspects of the figure.

6. AFTER ACCEPTANCE

Upon approval of a paper for publication, the manuscript will be forwarded to the dean, who is responsible for the publication of the Global Journals Inc. (US).

6.1 Proof Corrections

The corresponding author will receive an e-mail alert containing a link to a website or will be attached. A working e-mail address must therefore be provided for the related author.

Acrobat Reader will be required in order to read this file. This software can be downloaded

(Free of charge) from the following website:

www.adobe.com/products/acrobat/readstep2.html. This will facilitate the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof.

Proofs must be returned to the dean at dean@globaljournals.org within three days of receipt.

As changes to proofs are costly, we inquire that you only correct typesetting errors. All illustrations are retained by the publisher. Please note that the authors are responsible for all statements made in their work, including changes made by the copy editor.

6.2 Early View of Global Journals Inc. (US) (Publication Prior to Print)

The Global Journals Inc. (US) are enclosed by our publishing's Early View service. Early View articles are complete full-text articles sent in advance of their publication. Early View articles are absolute and final. They have been completely reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after sending them. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the conventional way.

6.3 Author Services

Online production tracking is available for your article through Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The authors will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript.

6.4 Author Material Archive Policy

Please note that if not specifically requested, publisher will dispose off hardcopy & electronic information submitted, after the two months of publication. If you require the return of any information submitted, please inform the Editorial Board or dean as soon as possible.

6.5 Offprint and Extra Copies

A PDF offprint of the online-published article will be provided free of charge to the related author, and may be distributed according to the Publisher's terms and conditions. Additional paper offprint may be ordered by emailing us at: editor@globaljournals.org .

the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

4. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. **Pick a good study spot:** To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. **Think technically:** Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be

sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page

- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to

shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.
- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw th

principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.

- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

Administration Rules Listed Before Submitting Your Research Paper to Global Journals Inc. (US)

Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation)
by Global Journals Inc. (US)

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals Inc. (US).

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

save our planet

Global Journal of Medical Research

Visit us on the Web at www.GlobalJournals.org | www.MedicalResearchJournal.org
or email us at helpdesk@globaljournals.org

ISSN 09755888