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Rated Assessment of Conflict

Highlights

Stress and Coping Strategies

Implantable Medical Textiles

Discovering Thoughts, Inventing Future

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Essential Medicine and Equipment for Emergency Obstetric and Newborn Care in Zanzibar: Situation at a Glance

By Andrea B. Pembe, Bruno Sunguya, Stella Mushy, Sebalda Leshabari, George Kiwango, Chirsker Masaki & Linda B. Mlunde

Muhimbili University of Health and Allied Sciences

Abstract- *Background:* Maternal and neonatal mortality are unacceptably high in Zanzibar. Maternal mortality and neonatal mortality ratio stand at 350 per 100,000 live births and 29 per 1,000 live births respectively as of 2018. Addressing challenges facing maternal and newborn health requires among others, the assurance of essential medicine and equipment to deliver evidence based interventions. This paper reports evidence gathered on the availability of essential medicines and equipment in providing Emergency Obstetric and Newborn Care (EmoNC) services in Zanzibar.

Methods: A cross-sectional mixed methods study design was used to collect information on the availability of drugs and equipment from all health facilities providing delivery services in Zanzibar. Semi-structure interview guide was used to carry in-depth interviews (IDIs) with health facility in-charges while observation on availability of essential medicine and equipment for EmONC was carried using standard observation guide as adopted from Averting Maternal Death and Disability program.

Keywords: *emergency obstetric and new-born care, maternal health, signal functions, essential medicine, zanzibar, drugs and supplies, tanzania.*

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Essential Medicine and Equipment for Emergency Obstetric and Newborn Care in Zanzibar: Situation at a Glance

Andrea B. Pembe [α], Bruno Sunguya [σ], Stella Mushy [ρ], Sebalda Leshabari [ω], George Kiwango [¥], Chirsker Masaki [§] & Linda B. Mlunde [χ]

Abstract- Background: Maternal and neonatal mortality are unacceptably high in Zanzibar. Maternal mortality and neonatal mortality ratio stand at 350 per 100,000 live births and 29 per 1,000 live births respectively as of 2018. Addressing challenges facing maternal and newborn health requires among others, the assurance of essential medicine and equipment to deliver evidence based interventions. This paper reports evidence gathered on the availability of essential medicines and equipment in providing Emergency Obstetric and Newborn Care (EmoNC) services in Zanzibar.

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Results: Evidence shows that there is still a challenge in the availability of essential medicine and supplies in health facilities. The most common available antibiotic was amoxicillin, available in 86.3% of all health facilities. In almost all essential medicines, availability is lower in lower levels health facilities compared to higher levels. For example, diazepam was available in 85.7% of hospitals but only in 55% of lower level health facilities. Majority of the delivery health facilities had items for the delivery set. The least found items in the delivery set were long gloves and pean artery forceps which were found in only 13.7% and 37.3% of all the facilities respectively. The shortage of equipment affected lower level facilities more than higher level facilities. For instance, episiotomy scissors were found in 71.4% of higher level but in 57.5% of lower health facilities.

Conclusion: Delivery of quality EmONC in Zanzibar is challenged by inadequate availability of medicines and equipment in facilities especially the PHCU+ and PHCC. None of the PHCU+ has all the essential drugs and equipment to deliver EmONC thus exposing the women and newborns to morbidity and mortality. To ensure delivery of quality EmONC, it is important to ensure adequate availability of all essential antibiotics, antihypertensives, anticonvulsants, and equipment for delivery, removal of products of conception and resuscitation of newborns in Zanzibar.

Keywords: emergency obstetric and new-born care, maternal health, signal functions, essential medicine, zanzibar, drugs and supplies, tanzania.

Keywords: EmONC, essential medicine, resuscitation, maternal health, Zanzibar.

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I. Background

Although, the global maternal deaths dropped from 532,000 in the 1990s to 303,000 in 2015 (1), the burden has remained unacceptably high. Furthermore, estimates show that 99% of all maternal deaths occur in low- and middle-income countries with 66% of maternal deaths occurring in sub-Saharan Africa (1).

Improvement of maternal health indicators calls for health system strengthening. One of the six important health system pillars is ensuring availability of medicine and supplies. For maternal health, lack or challenge in such important pillar is behind a number of preventable maternal deaths globally, and Tanzania is not an exception. Availability and provision of essential medicines including parenteral antibiotics, uterotonic drugs, parenteral anticonvulsants and anaesthetic drugs; and equipment including manual vacuum aspirators, vacuum extractor and set for basic neonatal resuscitation are therefore vital in addressing the direct causes of maternal and newborn deaths. Major direct causes of maternal deaths including infections, hypertensive disease in pregnancy and eclampsia, bleeding, obstructed labor, abortion complications (2, 3) and causes of newborn deaths can be averted by providing Emergency Obstetric and Neonatal care (EmONC) (4).

Tanzania (comprised of mainland and Zanzibar islands) like other sub-Saharan Africa has a high maternal mortality ratio of 556 deaths per 100,000 live births (5) with a significant variation between regions and geographical areas. Zanzibar records maternal

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mortality ratio as high as 350/100,000 live births (6). While Zanzibar has made significant gains in reducing infant mortality from 54 deaths per 1000 live births in 2010 to 45 deaths per 1000 live births in 2015. Facility-based data show an increase of maternal deaths from 187 per 100,000 live births in 2014 to 276 maternal deaths per 100,000 live births in 2016. For the neonatal mortality, another important indicator, is still very high at a level of 25 neonatal deaths per 1000 live births (5).

While poor access to health facilities contribute to high burdens of maternal and neonatal mortality in many parts of the world (7), women in Zanzibar may have a different set of challenges as 95% of the population live close proximity to health facilities and have access to care (2). Evidence gathered from Zanzibar revealed shortage of drugs and supplies contribute to this poor trend in maternal mortality. The ministry of health and implementing UNFPA commissioned a survey in 2012 to assess Emergency Obstetric and Neonatal Care (EmONC) indicators in the isles that show similar challenges reported. However, how much has been done with respect to providing the facilities with equipment and medical supplies since those studies were conducted remains unknown. This is a follow up survey aimed to examine the changes made in this regard. It aimed at documenting the situation at glance with respect to essential medicines and equipment for provision of quality EmONC in Zanzibar.

II. Methods

a) Study design

A cross sectional mixed methods study design employing both quantitative and qualitative approaches was used. The quantitative approach used systematic observation while the qualitative approach adopted in-depth interviews with key stakeholders on availability of medicine for provision of maternal and newborn care.

b) Study setting

This study was part of the larger study to assess EmONC in Zanzibar in the year 2018. The health care system is organized into three levels, the primary, secondary, and tertiary levels. More details on the study setting and sampling are provided elsewhere (8). The focus of this study is on the 51 facilities offering delivery services including the National, Mnazi Mmoja hospital; five district hospitals and one maternity hospital; four primary health care centers (PHCC); 33 primary health care unit plus (PHCU+) and seven primary health care units (PHCU).

c) Data collection

Data collection was done using the Averting Maternal Death and Disability (AMDD) (9) program tools to observe the availability of medicines and equipment and medical supplies for EmONC. The tools were formatted to suit Open Data Kit (ODK) format and uploaded to tablets that were used for data collection.

For the qualitative part, a semi-structured interview guide was used to interview the in-charge or a health worker who provides maternal and new born services in the respective health facility. The later was developed based on prior knowledge of the investigators and literature existed on the question under study. The interviews were scheduled to fit the convenience of the informant and they were carried out in privacy within the facility. Experienced qualitative researchers who were accompanied by trained research assistants for notes taking and audio recording carried out the interviews in Swahili, using digital voice recorders.

d) Data analysis

Quantitative data were transformed from the ODK server to STATA for analysis. Descriptive analyses were conducted and results summarized in frequency tables and figures. The health facilities were grouped into 4, hospitals including the National hospital, district hospitals and maternity hospital, PHCC and PHCU+/PHCU. For the qualitative data analysis, first, we transcribed verbatim all audio-recorded interviews. In order to become familiar with the content and context, all authors read the full transcripts and field notes repeatedly before the start of analysis. We used a hybrid thematic data analysis approach; this approach used both inductive and deductive reasoning.

e) Ethical consideration

The study was approved by the Zanzibar Medical Research Ethics Council (ZAMREC) and the permission to conduct the study was given by the Ministry of Health of the Revolutionary Government and respective regions, districts and facility authorities. Participation into the study was voluntary, and researchers ensured confidentiality and privacy of participants. Participants signed an informed consent before interviews and were free to stop the interview at any time without repercussion.

III. Results

a) Availability of essential drugs

Levels of availability of essential medicine varied widely (Table 1). The most common available antibiotic was amoxicillin, available in 86.3% of all health facilities. The least available were cephazoline sodium, chloramphenicol (injection), clindamycin, and cloxacillin sodium all in 3.9% of all health facilities respectively. In almost all essential medicines, availability is lower in lower levels health facilities compared to PHCC and above levels.

For anticonvulsants, magnesium sulphate was available in only 76.5% of facilities providing delivery services. Only two thirds of facilities had diazepam while

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phenobabrbitone was available in only one quarter. In this regard too, availability levels were lower in lower levels health facilities compared to those in PHCC and above. For antihypertensives, Nifedipine was available in three quarter of the health facilities. However, other essential antihypertensive medicines such as methyl-dopa and hydralazine were available in only 27.5% and 21.6% respectively. Oxytocin was available in 92.2% of the facilities, however one fourth of facilities did not have misoprostol and ergometrine was rarely available. The trend was almost the same for all levels of facilities.

Table 1: Availability of drugs in the health facilities on the day of the visit

Drugs		Health facility level		
	Total N =51	Hospitals N = 7	PHCC N = 4	PHCU+/PHCU N = 40
	n (%)	n (%)	n (%)	n (%)
Antibiotics				
Amoxicillin	44 (86.3)	7 (100.0)	4 (100.0)	33 (82.5)
Ampicillin	10 (19.6)	2 (28.6)	1 (2.0)	7 (17.5)
Cephazoline sodium	2 (3.9)	0 (0.0)	0 (0.0)	2 (5.0)
Cefixime	6 (11.8)	3 (42.9)	1 (25.0)	2 (5.0)
Ceftriaxone	34 (6.7)	6 (85.7)	4 (100.0)	24 (60.0)
Chloramphenicol (injection)	2 (3.9)	1 (14.3)	0 (0.0)	1 (2.5)
Clindamycin	2 (3.9)	1 (14.3)	0 (0.0)	1 (2.5)
Cloxacillin sodium	2 (3.9)	0 (0.0)	0 (0.0)	2 (5.0)
Gentamycin	15 (29.4)	7 (100.0)	1 (25.0)	7 (17.5)
Metronidazole injection	20 (39.2)	7 (100.0)	4 (100.0)	9 (22.5)
Benzyl penicillin	17 (33.3)	5 (71.4)	2 (50.0)	10 (25.0)
Procaine Benzylpenicillin	19 (37.3)	5 (71.4)	1 (25.0)	13 (32.5)
Anticonvulsants				
Magnesium sulphate (injection)	39 (76.5)	7 (100.0)	4 (100.0)	28 (70.0)
Diazepam	31 (60.8)	6 (85.7)	3 (75.0)	22 (55.0)
Phenobarbitone	11 (21.6)	3 (42.9)	1 (25.0)	7 (17.5)
Phenyton	4 (7.8)	2 (28.6)	0 (0.0)	2 (5.0)
Antihypertensives				
Hydralazine	11 (21.6)	7 (100.0)	2 (50.0)	2 (5.0)
Labetalol	1 (2.0)	1 (14.3)	0 (0.0)	0 (0.0)
Methyldopa	14 (27.5)	7 (100.0)	1 (25.0)	6 (15.0)
Nifedipine	39 (76.5)	6 (85.7)	4 (100.0)	29 (72.5)
Oxytocics				
Oxytocin	47 (92.2)	7 (100.0)	4 (100.0)	36 (90.0)
Ergometrine	2 (3.9)	1 (14.3)	0 (0.0)	1 (2.5)
Misoprostol	35 (68.6)	7 (100.0)	4 (100.0)	24 (60.0)

b) *Stock out of drugs within the past three and six months*

To get the insight of the real situation we also collected data on the drugs stock out within the past three and six months. The essential antibiotics assessed included ampicillin, gentamicin injection, metronidazole injection, penicillin G, and procaine benzylpenicillin. Table 2 shows that, a total of 34 health facilities confirmed they had stock out of any of the mentioned essential antibiotic. This is 67% of all facilities and the challenge is higher in lower level facilities compared to higher ones. More than two thirds of PHCU had such stock out. In terms of duration, the analyses suggest that 12% of facilities had shortage in the past three months and all of them in lower level facilities. Compared to antibiotics, there was no significant challenge in stock out of oxytocics. Only three out of 51 facilities reported stock out of oxytocics. All of them are the low-level health facilities. Looking into three- or six-months records, only one facility had such shortage.

Table 2: Stock out of drugs in the health facilities providing delivery services in the past 3 and 6 months

Drugs		Health facility level		
	Total N=51	Hospitals N=7	PHCC N=4	PHCU+/PHCU N=40
	n (%)	n (%)	n (%)	n (%)
Any antibiotics stock out				
Yes	34 (66.7)	2 (28.6)	2 (50.0)	30 (75.0)
No	15 (29.4)	5 (71.4)	2 (50.0)	8 (20.0)

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Facility had never had these medicines	2 (3.9)	0 (0.0)	0 (0.0)	2 (5.0)
Any antibiotics stock out				
Past three months	6 (11.7)	0 (0.0)	0 (0.0)	6 (15.0)
Past six months	1 (2.0)	0 (0.0)	0 (0.0)	1 (2.5)
Oxytocics stock out				
Yes	3 (5.9)	0 (0.0)	0 (0.0)	3 (7.5)
No	48 (94.1)	7 (100.0)	4 (100.0)	37 (92.5)
Oxytocics stock out				
Past three months	1 (2.0)	0 (0.0)	0 (0.0)	1 (2.0)
Past six months	1 (2.0)	0 (0.0)	0 (0.0)	1 (2.0)

From the interviews, majority of the participants (public and private facilities) reported that the frequency of drugs stock out *has declined* as compared to previous years.

"About drugs we thank God because the most used drugs here like hydralazine, methyldopa, and antibiotics are available most of the time (General Nurse-1).

In other facilities despite acknowledging the declining in stock out frequency in general, participants stated that there was still frequently stock outs for some specific drugs.

"*Most of the drugs we mainly use in maternity are available, but for the last two months (March and April) we have been getting inadequate ferrous sulphate drugs" (General nurse-2).*

c) Availability of equipment

Majority of the delivery health facilities had items included in the delivery set. The least found items in the delivery set were long gloves, and pean artery forceps which were found in only 13.7% and 37.3% of all the facilities. The shortage of equipment affected lower level facilities more than higher level facilities (Table 3).

Table 3: Availability of delivery set/pack in health facilities providing delivery services (N=51)

Equipment and supplies		Health facility level		
	Total (N=51)	Hospitals (N=7)	PHCC (N=4)	PHCU+/PHCU (N=40)
	n (%)	n (%)	n (%)	n (%)
Artery forceps, 18cm, CVD	33 (64.7)	3 (42.9)	3 (75.0)	27 (67.5)
Sponge (ring) forceps	36 (70.6)	7 (100.0)	3 (75.0)	26 (65.0)
Dissecting forceps, standard pattern	32 (67.4)	5 (71.4)	3 (75.0)	24 (60.0)
Pean artery forceps, straight	19 (37.3)	4 (57.1)	1 (25.0)	14 (35.0)
Cord-cutting scissors, curved,	41 (80.4)	6 (85.7)	3 (75.0)	32 (80.0)
Cord ties	36 (70.6)	5 (71.4)	2 (50.0)	29 (72.5)
Episiotomy scissors, angular	31 (60.8)	5 (71.4)	3 (75.0)	23 (57.5)
Straight stitch scissors	23 (45.1)	4 (57.1)	3 (75.0)	16 (40.0)
Gloves	45 (88.2)	7 (100.0)	4 (100.0)	34 (85.0)
Long gloves	7 (13.7)	4 (57.1)	0 (0.0)	3 (7.5)
Plastic sheeting	30 (58.8)	5 (71.4)	3 (75.0)	22 (55.0)
Gauze swabs	47 (92.2)	7 (100.0)	4 (100.0)	36 (90.0)
Clothes	14 (27.5)	4 (57.1)	2 (50.0)	8 (20.0)

Table 4 shows the results of availability of manual vacuum aspiration equipment in health facility providing delivery services. Of all the facilities, less than half had the equipment. It is worth-noting that, lower level health facilities bears the bigger brunt of such deficiency.

Table 4: Availability of manual vacuum aspiration equipment in health facilities providing delivery services (N=51)

Equipment and supplies		Health facility level		
	Total (N=51)	Hospitals (N=7)	PHCC (N=4)	PHCU+/PHCU (N=40)
	n (%)	n (%)	n (%)	n (%)
Vacuum aspirators/syringes	22 (43.1)	4 (57.1)	4 (100.0)	14 (35.0)
Silicone lubricant	9 (17.7)	2 (28.6)	1 (25.0)	6 (15.0)
Other lubricant oil	6 (11.8)	2 (28.6)	3 (75.0)	1 (2.5)
Flexible cannulae (all sizes)	13 (25.5)	3 (42.9)	2 (50.0)	8 (20.0)

Table 5 shows the neonatal resuscitation pack items found in delivery health facilities. The commonest items found are ambu bag (90.2%) and infant face masks (80.4). The least items found in the facilities are Infant laryngoscope with spare bulb and batteries and endotracheal tubes both found at 9.8% of all the delivery health facilities. A low proportion of the low-level health facilities had the resuscitation pack items.

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Table 5: Availability of neonatal resuscitation pack in health facilities providing delivery services (N=51)

Equipment and supplies		Health facility level		
	Total (N=51)	Hospitals (N=7)	PHCC (N=4)	PHCU+/PHCU (N=40)
	n (%)	n (%)	n (%)	n (%)
Mucus extractor	27 (52.9)	3 (42.9)	3 (75.0)	21 (52.5)
Infant face masks, sizes 0,1,2	41 (80.4)	7 (100.0)	4 (100.0)	30 (75.0)
Ambu (ventilator) bag	46 (90.2)	7 (100.0)	4 (100.0)	35 (87.5)
Suction catheter, 10, 12 Ch	28 (54.9)	6 (85.7)	4 (100.0)	18 (45.0)
Infant laryngoscope with spare bulb and batteries	5 (9.8)	2 (28.6)	1 (25.0)	2 (5.0)
Endotracheal tubes, 3.5, 3.0	5 (9.8)	2 (28.6)	1 (25.0)	2 (5.0)
Disposable uncuffed tracheal tubes, sizes 2.0 to 3.5	4 (7.8)	1 (14.3)	0 (0.0)	3 (7.5)
Suction aspirator (operated by foot or electrically)	20 (39.2)	5 (71.4)	2 (50.0)	13 (32.5)
Mucus trap for suction	9 (14.3)	3(42.9)	3 (75.0)	3 (7.5)

From the interviews with health workers, they confirmed the shortage of equipment and added that some of the available equipment were worn out or outdated. The outdated equipment were mostly available in public health facilities.

"We are in a modernized world but surprisingly we are still using the old pumping BP machine that uses not less than 10 minutes to attend one patient instead of using monitor that takes one minute to measure BP, PR, Temperature, oxygen saturation. We need monitor so as to reduce waiting time for clients/patients when checking for vital signs". (labor ward nurse-1)

To explain the magnitude of the situation, in some facilities the main reported challenge was on neonatal resuscitation. The participants stated that on absence of resuscitation table it becomes very hard to ensure quality of care to the newborn.

"Newborn services we provide, I can say it is of quality. But there is what we call resuscitation table which we don't have it in labour ward as well as oxygen cylinder. So when we get a baby with difficulty breathing we are not in a position to help him/her breath instead we refer the baby" (Nurse-Midwife-3).

IV. Discussion

Essential medicine and supplies is one of the six important health system building blocks as proposed by the WHO (11). Lack or challenges in meeting the demand of essential medicine and supplies have negative consequences in addressing any health challenge (12), maternal and new born health is no exception. Efforts to improve maternal health in the country has been receiving unequal gains. Lack or poor access and availability of essential medicine and supplies remain among the challenges in delivering quality emergency maternal and newborn care (EmONC) (13, 14). In realizing its needs, the revolutionary government of Zanzibar in collaboration with UNFPA conducted a baseline survey to examine key aspects and needs to deliver EmONC in 2012. One of the objectives was to examine availability of essential medicine for meeting EmONC targets in the isles. The evidence generated helped to guide the selected interventions and investment thereof. In looking on the remaining challenges, we conducted the current study to examine the current situation in terms of essential medicine and medical supplies.

In terms of essential medicine to prevent maternal and new-born deaths, evidence collected reveleal a persistent challenge in accessing some of the essential medicine. For maternal and newborn challenges, the leading causes of deaths include infections such as postpartum sepsis, haemorrhage both before, during, and after delivery, pregnancy induced hypertension and eclampsia, among others. Addressing such challenges call for ensuring availability of preventive and curative medicines at all the times in all facilities where delivery takes place.

For antibiotics, the commonest found essential item was amoxicillin while all others were at the level below 50%. The challenge in availability is more common in lower level facilities compared to higher ones. This was the same for all other medicine. The challenge of poor availability of essential medicine in low level health facilities is common in other settings. Delivery of quality health services especially that of EmONC depends very much in availability of quality essential medicine (15). This can be improved when needs are established in time and medicines are ordered and delivered in time (16).

Apart from infections, other causes of maternal mortality include haemorrhage and pregnancy induced hypertension (16). This is also common trend in Tanzania (17). It is therefore essential to ensure availability of essential medicine to address these two conditions (18). To ensure quality EmONC service delivery, availability of antihypertensive and oxytocics is of paramount importance (15). In this survey, essential anti-colvusants were available in only two thirds of the facilities offering delivery services. Hypertensives were also not available in majority of health facilities. This is

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worrisome and could be one of the factors behind lives lost in health facilities in Zanzibar. Oxytocics are widely available and this is a significant improvement compared to the previous rates. Although some essential medicines are somehow not available in some surveyed facilities, interviewed health workers explained that the situation has improved significantly compared to the past.

Zanzibar has made significant improvement in ensuring availability essential medical supplies to address EmONC. Our observation and testimonies from the interviewed health workers revealed such improvement in supplies making up the delivery kit, resuscitation equipment, but not manual vacuum aspiration equipment. Such improvement needs to be sustained and extending to ensure replacement of worn-out equipment to ensure delivery of quality health services (19).

V. Study Limitation

Some of the data used a cross sectional design that may limit studying causality. However, we employed mixed method design to ameliorate effects posed by designs. For example, the use of qualitative design helped to understand opinions from health workers and therefore somehow explain some of the results we presented. Despite covering all districts and regions in Zanzibar, data on EmONC presented in this report can lack generalizability to beyond health facilities. The use of qualitative survey which was not in the previous survey has captured voices of health workers in challenges they face in EmONC services as well as training and skills needed. Moreover, we used electronic data collection system that reduces chances of errors in data collection and cleaning. Quality of this data is therefore improved compared to the previous survey.

VI. Conclusion and Recommendations

Availability of essential medicine and supplies for EmONC have improved in Zanzibar, but remains a challenge particularly in low level of health facilities. Efforts are needed to ensure availability of medicine and supplies to carter for all emergencies including anticonvulsants, antibiotics, and antihypertensives. Health facilities lack equipment for neonatal resuscitation.

Abbreviations

ANC: antenatal clinic;
AMDD: Averting Maternal Death and Disability;
EmONC: Emergency Obstetric and New-born Care;
MoH: Ministry of Health;
ODK: open data kit;
PHCC: Primary Health Care Center;
PHCU: Primary Health Care Units;
PHCU+: Primary Health Care Units Plus;
SOPs: standard operating procedures;
UNFPA: United Nation Population Fund;
WHO: World Health Organization.

Ethics approval and consent to participate

The research team worked with the Ministry of Health Zanzibar on necessary documents for ethical approval by Zanzibar Institute Review Board. All ethical guidelines were followed to ensure ethical conduct with participants. Authorities were contacted for their approval; the MoH issued an introductory letter from the ministry to each relevant authority. Participation into this study was voluntary, and researchers ensured confidentiality and privacy of participants. Participants signed an informed consent before interviews and were free to stop the interview at any time without repercussion.

Consent for publication

Study participants were informed on the dissemination of the finds without disclosing their personal identity and they agreed.

Availability of data and materials

The dataset analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest

The authors declare that they have no competing interest.

Funding

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Authors' contribution

ABP, BS, SM and SL designed the study. SM, BS, SM and GS supervised data collection. CM and LBM analysed the data. ABP and SM drafted the first manuscript. All authors reviewed the subsequent drafts of the manuscript and approved the final version for submission.

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Perceived Stress and Coping Strategies among First Year Undergraduate Medical Students: A Cross-Sectional Study, Thrissur District, Kerala

By Maria Mathew, Navya C J & Vidhu M Joshy

Abstract- Coping strategies used by an individual for stress determine its effect on health and the body's functioning. Academic challenges make the first year medical students disparately susceptible to it. A cross-sectional study was conducted among the first year undergraduate medical students of a private medical college in Thrissur, Kerala to find the prevalence of stress and the coping strategies used with the help of pretested and validated questionnaire containing the Perceived Stress Scale 10 (PSS-10) and Brief COPE Inventory. 73% of the students had moderate stress and, 20% of the students had high-stress scores. Self-distraction and religion {(6.66 ±1.52), (6.55 ±1.58)} were the most common coping strategies used by the boys and girls respectively. The prevalence of stress was high among the first year undergraduate medical students and those with high-stress scores were found to use maladaptive coping strategies.

Keywords: *coping strategies, medical students, perceived stress.*

GJMR-K Classification: *NLMC Code: W 84.5*

PERCEIVEDSTRESSANDCOPINGSTRATEGIESAMONGFIRSTYEARUNDERGRADUATEMEDICALSTUDENTSACROSS-SECTIONALSTUDYTHRISSURDISTRICTKERALA

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Perceived Stress and Coping Strategies among First Year Undergraduate Medical Students: A Cross-Sectional Study, Thrissur District, Kerala

Maria Mathew [α], Navya C J [σ] & Vidhu M Joshy [ρ]

Abstract- Coping strategies used by an individual for stress determine its effect on health and the body's functioning. Academic challenges make the first year medical students disparately susceptible to it. A cross-sectional study was conducted among the first year undergraduate medical students of a private medical college in Thrissur, Kerala to find the prevalence of stress and the coping strategies used with the help of pretested and validated questionnaire containing the Perceived Stress Scale 10 (PSS-10) and Brief COPE Inventory. 73% of the students had moderate stress and, 20% of the students had high-stress scores. Self-distraction and religion {(6.66 ±1.52), (6.55 ±1.58)} were the most common coping strategies used by the boys and girls respectively. The prevalence of stress was high among the first year undergraduate medical students and those with high-stress scores were found to use maladaptive coping strategies.

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I. Introduction

Coined by the endocrinologist Hans Salve in the 1930s[1], 'stress' is described as any factor that threatens the health of an individual or hurts the body's functioning[2]. Tertiary education is highly stressful to students[3], and various studies indicate that medical students face unique academic challenges that make them more vulnerable to it than students in other professional courses[4]. The vast syllabus, peer competition for academic performance, continuous evaluation and long duration of training include the most common stressors[5]. Although a minimal amount of stress is desirable and is necessary to spark a healthy competitive spirit, in excess it has undesirable impacts on the students[6]. It may lead to anxiety, substance abuse, and burnouts leading to the abandonment of studies, depression, and even suicidal thoughts[7, 8, 9]. There is impairment in academic performance as well as in the social life of the student[10]. Medical students seem to be stressed at all stages of their academic career, including pre-clinical, and clinical years[11-14]. First semester students were found particularly prone due to the transition to a new environment[11].

Coping strategies are specific efforts, both behavioral and psychological, that individuals employ to master, tolerate, reduce, or minimize stressful events[15]. Previous studies have shown that coping plays a pivotal role in adaptation to stressful life events[16]. Coping strategies are classified into active and avoidant strategies[17]. Active coping is considered a better way to deal with stress, while avoidant coping is a psychological risk factor for adverse responses to stressful events[18].

Stressed students may show decay in humanitarian attitudes[19] and a decline in empathy[20]. The students, being the future doctors, to ensure patient safety, it is essential to focus on their mental health. The gravity of the issue and the scarcity of information about the same validates the choice of this topic. The study aimed to find the prevalence of stress and the coping strategies used to overcome it in the first year undergraduate medical students of a private institution in Thrissur, Kerala.

II. Materials and Method

A cross-sectional study was conducted among the first year undergraduate medical students (100) enrolled in the year 2017-2018 in a private medical college in Thrissur, Kerala. After obtaining informed consent, a self-administered, pretested questionnaire was distributed to the students, and they were detailed with instructions to fill it.

There were questions regarding the socio-demographic details, the Perceived Stress Scale – 10 (PSS 10) Developed by Carver et al. in 1997, it categorized the coping strategies as an instrument for measuring the level of stress. To find coping strategies used by the students, an abbreviated version of the COPE Inventory called the Brief COPE was used. Developed by Carver et al. in 1997, that categorized the

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coping strategies as 'adaptive' and 'maladaptive' composites. Adaptive strategies include active coping, use of emotional and instrumental support, positive reframing, planning, humor, religion, etc. Maladaptive strategies are self-distraction, denial, substance abuse, venting, and self-blame. Students repeating their first year were excluded from the study.

The collected data was statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 23 software. A p-value less than 0.05 was taken as statistically significant.

III. Results

a) Socio-demographic description

All the 100 students completed the questionnaire (response rate 100%). Majority of the students were girls (62%), and the mean age of the population was 19.71 with SD 0.92.

b) Perceived Stress Scores

The mean PSS score was 21.77±5.17. Moderate stress was reported by 73% of the students, and 20% had high stress (Table 1), which was found more in boys (23.68%) than girls (17.74%). But this was not found to be statistically significant. (Table 2)

c) Coping strategies among students

Among the coping strategies used by the students, self-distraction was found to be most common with mean score 6.38 ±1.376, and substance use was the least with a mean score 2.35±1.114 (Table 3). It was found that self-distraction was more popular among the boys (6.66 ±1.529), while religion was the main strategy used by the girls (6.55 ±1.586) which was found to have a significant difference (p=0.0001) than the boys. Substance abuse (p=0.001) and denial (p=0.010), which are maladaptive strategies were significantly used more by the boys. Adaptive strategies like planning (p=0.027) and use of instrumental support (p=0.049) were seen to be more with the girls (Table 4). Majority of the students used adaptive strategies. As the level of stress increased, the mean scores of students using maladaptive strategies to cope also increased, with a p-value of 0.001(Table 5). Between the high PSS scores and maladaptive strategies, the Pearson correlation coefficient was found to be r = 0.296 and the p-value was 0.003. (Table 6)

Table 1: Perceived stress using PSS-10

PSS-10 Score	%
Low stress (0-13)	7
Moderate stress (14-26)	73
High stress (27-40)	20
Total	100

Table 2: Gender distribution and PSS scores

Gender	PSS Total Score			Total
	Low stress	Moderate stress	High stress	
Female	2 (3.2)	49 (79.0)	11(17.7)	62
Male	5 (13.1)	24 (63.2)	9 (23.7)	38
Total	7	73	20	100

p value=0.108

Table 3: Coping strategies among the students

Coping Strategy	Mean	SD
Self-distraction	**6.38**	**1.376**
Active coping	5.83	1.164
Denial	3.70	1.655
Substance use	2.35	1.114
Use of emotional support	5.40	1.700
Use of instrumental support	5.46	1.726
Behavioral disengagement	4.20	1.706
Venting	5.08	1.489
Positive reframing	5.83	1.615
Planning	5.79	1.409
Humor	5.06	1.763
Acceptance	5.96	1.428
Religion	**6.01**	**1.904**
Self blame	4.65	1.690

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Table 4: Gender and coping strategies of the students

Coping Strategy	Female		Male		t value	p value
	Mean	SD	Mean	SD		
Self-distraction	6.21	1.256	6.66	1.529	1.593	0.114
Active coping	5.97	1.116	5.61	1.220	1.522	0.131
Denial	3.37	1.358	4.24	1.951	2.614	0.010*
Substance use	2.06	.400	2.82	1.642	3.451	0.001*
Use of emotional support	5.39	1.643	5.42	1.810	0.096	0.923
Use of instrumental support	5.73	1.681	5.03	1.732	1.997	0.049*
Behavioral disengagement	3.95	1.624	4.61	1.779	1.884	0.063
Venting	5.31	1.313	4.71	1.691	1.971	0.052
Positive reframing	5.90	1.399	5.71	1.930	0.577	0.565
Planning	6.03	1.414	5.39	1.326	2.240	0.027*
Humor	4.87	1.779	5.37	1.715	1.376	0.172
Acceptance	6.03	1.330	5.84	1.586	0.644	0.521
Religion	6.55	1.586	5.13	2.069	3.856	0.0001*
Self blame	4.53	1.576	4.84	1.868	0.889	0.376

* $p < 0.05$

Table 5: Levels of stress and maladaptive coping

PSS Score	%	Maladaptive coping		p value
		Mean	SD	
Low stress	7	24.00	6.000	0.001*
Moderate stress	73	25.56	4.658	
High stress	20	30.10	6.025	

*$p < 0.05$

Table 6: Correlation between coping strategies used and stress levels

Type of coping strategy	Pearson Correlation coefficient (r)	P value
Adaptive coping	-0.093	0.359
Maladaptive coping	0.296	0.003*

* $p < 0.05$

IV. Discussion

Medical students are expected to learn and master a vast amount of knowledge, attitudes, and skills for which they have to work hard which in turn put them under a lot of stress[21]. As per our study, the mean (PSS) Perceived Stress Score (SD) was 21.77 (5.17). A similar study done by Shakthivel et al. using PSS-10 had a mean stress score value of 17 with an SD of 6.5[22].Moderate levels of stress were experienced by 73% of the students and high levels by 20%. The rest of the students experienced low stress (7%).Results obtained by a similar study done in Maharashtra, India recorded that 85% of the first year medical students were stressed[23].

Various coping strategies were employed by the students to overcome stress, among which self-distraction (maladaptive), had the highest mean score (SD) of 6.38 (1.37), closely followed by religion (adaptive) with 6.01 (1.90). Results obtained by Samira et al. (2015) also showed maladaptive methods like 'self-blame' and 'self-criticism' as the common reactions to stress. Religious coping was frequently adopted as a coping measure, while the use of alcohol or other drugs was found to be rare[24].There were significant associations between coping strategies like substance use (p=0.001), denial (p=0.01) with the males and planning (0.027), religion (0.0001) with the females. With increasing levels of stress, the students used maladaptive strategies to cope up. An H et al. in their study also recorded that students using avoidant strategies experienced higher stress than others[25].

V. Conclusion

Moderate to high levels of stress were present in the first year medical students of this institution. To cope up with this, the students used different coping strategies of which self-distraction, religion, active coping, and acceptance were the most common. Students with high stress commonly used maladaptive strategies. Further studies are required to assess the long term effects of the stress in the students' lives.

Recommendations Stress among the medical students is seen from the first year of the course and therefore is to be managed from the beginning. Stress management workshops, counseling of the students, promote techniques for meditation like yoga, time management, educating the students about the ill effects of stress and maladaptive coping methods are necessary.

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Rethinking Public-Private Partnerships (PPPs) in Healthcare: Integrating Social Impact into the Working Model

By Odhiambo David

Introduction- Public-Private Partnerships (PPPs) are collaborations between the public and private sector organizations i.e. for profit, not for profit, faith-based or NGOs. These engagements can be in the form of institutional arrangements ranging from simple collaboration, joint venture programs, direct contract lease and concessions among others (Mwageni, December 2006).

PPPs are forged with to meet a common need which either entity alone cannot be able to realize (Thadani, 2014). In most cases, they are designed to take advantage of the strengths of both parties in a structured arrangement i.e. better managerial competencies in the private sector and huge resource pool in the public sector to realize a common goal.

The benefits attributed to PPP's include improved physical access to services in under-served areas, efficiency in the use of health resources by leveraging technical and managerial competencies of the private sector, prevent impoverishment of the uninsured & marginalized individuals, equity in access to services not available in the public sector, improved health infrastructure, regulatory and oversight on health standards (Bjorkman, 2015). These benefits double as the partners' aspirations in such arrangements especially within the confines that health is a social need that falls within the premise of governments to ensure access while private entities have an interest for their business success.

GJMR-K Classification: *NLMC Code: W 84.6*



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I. Introduction

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PPPs are forged with to meet a common need which either entity alone cannot be able to realize (Thadani, 2014). In most cases, they are designed to take advantage of the strengths of both parties in a structured arrangement i.e. better managerial competencies in the private sector and huge resource pool in the public sector to realize a common goal.

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The key factors that drive governments to establish PPPs as argued by the Africa Health Forum Finance and Capacity and Results are:

i. The desire to improve the operation and performance of public health services and facilities and to expand access to improved quality services
ii. An opportunity to leverage private investment for the benefit of public services
iii. The desire to formalize arrangements with non-profit partners who deliver a substantial share of public services
iv. An increase in the potential partners for governments as the private healthcare sector matures (Africa Health Forum: Finance and Capacity for Results, 2013).

With these in sight, it's critical to assess the different models of engagement in PPP currently being employed and propose new models which would bridge the gap and fuel the transition to UHC since this is an ever desired most elusive target.

II. Public-Private Partnership Models in Healthcare

There are three main working PPP models in place which include:

i. Health services-only model where a private entity is given the mandate to operate and deliver publicly funded services to citizens in public facilities.
ii. Facility finance model in which a public agency contracts a private organization to design, build, and finance and operate a health program/facility. Health services within such a facility are mostly provided by the government
iii. Combined facility finance and health services model where a private entity builds or leases a facility and delivers free or subsidized healthcare services to a specific population as per the agreement. (Independent Evaluation Group: World Bank Group, 2016).

The same model is confirmed to be a common case in facility-based PPPs as presented by PwC and Institute of Global Health Sciences in their Healthcare public-private partnerships series No. 4 (Abuzaineh, January 2018). This commonality confirms that most PPPs in health are limited to the provision of healthcare services and specifically with ensuring access through either facility development, service provision or financing of the same programs. The success of PPPs in healthcare to this stage are instrumental in shaping the next steps to be taken and this is affirmed by the discussions presented in the Africa Health Forum report (Africa Health Forum: Finance and Capacity for Results, 2013).

The Africa Health Forum report further presented categories of PPP models with key examples on where they have been successful;

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Table 1

Category	Private sector responsibility	Public sector responsibility
Public Health Services PPP e.g. - Performance-Based Financing (PBF) - Riders for Health (Transport) - Food Fortification (Salt Iodization)	· Management of services under contract ·Provision of either clinical and nonclinical services ·Provision of healthcare products, especially pharmaceuticals, at agreed rates ·Employment of staff and manage new capital investment, depending on the contract	· Contracts a private sector entity for the provision of public services · Pays for, monitors and regulates services & contract compliance by the private entity · May engage with development partners for the project
Hospital Services PPP e.g. - Brazil: Sao Paulo Hospitals.	·Manage public hospital as per the contract · Provide clinical and nonclinical services ·Employ all staff and be responsible for new capital investment as defined in the contract	· Contract a private firm for the provision of public hospital services · Pays for, monitors and regulates services rendered by the private operator as per the contract terms · May engage development partners
Facilities-finance PPP e.g. - United Kingdom: Private Finance Initiative	· To finance, construct, and own a new public health facility then lease it back to the government	· Manage a privately developed hospital and make lease payments to the private developer
Combined Facilities and Services PPP e.g. - Lesotho: Queen' Mamohato Memorial Hospital and Clinics	· To finance, construct, and operate a new public hospital - To provide clinical or non-clinical services or both	· Reimburse private operator for capital investment and recurrent costs for the services provided; - Provide relevant public premises such as land
Co-location PPP e.g. - South Africa: Pelonomi & Universitas Hospitals	· Operate a private section or department of the public facility · Fulfillpayment and service access conditions as agreed in the contract; - Maintain public land or building used	· Manage public section for public patients - Manage relationship with the private unit such as sharing of overhead costs and equipment · Supervise the fulfillment of patient access and other conditions as agreed on in the contract

III. Proposals on PPP

In the new wave of action towards UHC, there is a need to reassess the structures and models that have been adopted in PPPs for health and revamp the offerings for impact. In this new approach, private sector players should assess their offerings in light of their social impact on the communities in which they intend to operate. However, these should not be confused for Corporate-social responsibility (CSR) activities as they constitute the core business being conducted by the different partners in such an arrangement. PPPs with social impact is at the core of the post-industrial revolution as postulated by Karl Marx even though it may not come in the form of revolutions as defined by him (Anthony Giddens, 2012).

Initiative for PPPs should not be constrained to emanate from the public sector but should be driven from any party that identifies a need area which would be served better through a PPP. In so doing, any party will have the responsibility of researching on the healthcare needs and emerging concerns, designing interventions and proposing partnerships to ensure there is efficiency in the delivery of the same services with maximum impact. With such a shift in focus, instead of private health insurance companies focusing extensively on better ways of offering covers for medical care to cushion clients from burdensome healthcare costs, they will restructure to have offerings on health promotion programs and support for the determinants of health such as nutrition.

The upcoming avenues for massive PPP engagement are in the global health sphere and include:

i. Healthcare financing: With financial constraints that are limiting the ability of governments to cater to the healthcare needs of their citizenry. There is a need to find new frontiers for funding. Organizations such asGAVI, Co-Impact Lab, etc. are coming with new ways of mobilizing funds for interventions with impact and these should be benchmarks for healthcare financing as well. With most countries in the global south working towards structuring or restructuring their national health insurance schemes, PPPs should be focused on modalities of having comprehensive revenue management models which would ensure all facets of care are serviced i.e. preventive, health-promoting, curative, rehabilitative, palliative and infrastructural needs. This concept is currently under development and review by our team at Ryculture to come up with a Comprehensive Community-Based Health Insurance Scheme.

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ii. Immunization: there have been a re-emergence of outbreaks of disease which have been managed through vaccinations in the past such as the measlescase in the USA due to belief systems as witnessed with members of the Orthodox Church. Cases have also been witnessed as a result of lack of access to facilities in some developing countries. In the latter, PPPs with community pharmacies which are relatively more accessible to the public even in remote communities can help support the access to vaccines if structured to serve this gap, especially where geographical access has been a constraining factor. A partnership in this context would make the pharmacists serve a social need in the community while at the same time aiding governments in the provision of immunization services.

iii. Telemedicine: technology is becoming a part of our everyday lives even in the poorest of communities there is access to a mobile phone. This presents a great avenue to promote health where resource constraints have been an impediment. With a mobile phone patients can be able to secure consultations from qualified practitioners, access verified prescriptions, etc. However, for this to work, government policies, regulatory and structural interventions will be crucial in supporting the private sector in adopting such arrangements. Currently, this is taking root in Rwanda through the adoption of Babyl services which offers general practitioner consulting, prescription and referral systems via phone (Babylon Health Rwanda, 2019) and Japan (Kyodo, 2019).

IV. Conclusion

PPPs have helped ensure essential services which would otherwise not be provided by the public sector or the private sector alone are made available in an efficient manner to the public. This has been instrumental in promoting healthcare access especially in the low and middle-income countries (LMIC) as depicted by case analysis by the Africa Health Forum. However, in order to realize the goal of achieving UHC, we need to rethink our models for PPP with focus on the most pressing challenges, the available resources and the value we are bound to obtain from concerted investment in health through PPPs with a social conscience.

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Medical Textiles: Application of Implantable Medical Textiles

By Shah Md. Maruf Hasan, Md. Shahjalal, Jaglul Hoque Mridha & A. M. Riasat Alam
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Abstract- The use of textiles in the medical sector is increasing day by day. An important and emerging part of the textile industry is medical, hygiene and health care sector. Textiles are a compelling solution for implantable medical devices, primarily due to the versatility they offer in product design. Textiles are in 2D and 3D implantable forms, with configurations limited only by the imagination. The number of applications is enormous and diverse, ranging from a single thread suture to the complex composite structures for bone replacement and from the simple cleaning wipe to advanced barrier fabrics used in Operation Theater. The main object of this work is to study the types of implantable textiles used in the medical sector such as surgical suture, artificial skin, artificial ligament, and artificial cartilage. In this study, we have included different types of raw materials used and the manufacturing process of these implantable medical textiles.

Keywords: *implantable materials, non-implantable materials, chitin, collagen, ECM, ACL, biotextiles.*

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Keywords: implantable materials, non-implantable materials, chitin, collagen, ECM, ACL, biotextiles.

I. Introduction

Medical textiles are also known as Healthcare Textiles. The medical textile industry has diversified with new materials and innovative designs. Evolving polymer technology has yielded a wide range of applications of implantable medical textile devices. The Medical textile products are obtainable in woven, knitted and non- woven structure based on the area of application. Increasingly, synthetic fibre is being utilized in the manufacturing of these products.

Medical Textiles are defined in various ways, according to David Rigby Associates.

"The Medical Textile or Medtech application area "embraces all those technical textiles used in health and hygiene products"

"Textile Terms & Definitions" defines Medical Textiles as - "A general term which describes a textile structure which has been designed and produced for use in any of a variety of medical applications, including implantable applications."

II. Classification of Medical Textiles

a) Non-implantable materials

These materials use in external application on the body and may or may not make contact with the skin.

b) Implantable materials

These materials used in effecting a repair to the body whether it be wound closure (sutures) or replacement surgery (vascular grafts, artificial ligaments, artificial cartilage, etc.).

c) Extracorporeal devices

These are extra corporeally mounted devices used to support the function of vital organs, such as kidney, liver, lung, heart pacer, etc. The extracorporeal devices are mechanical organs that are used for blood purification and include the artificial kidney (dialyzer), the artificial liver, and the mechanical lung. The function and performance of these devices benefit from fiber and textile technology.

d) Healthcare/hygiene products

Healthcare and hygiene products are a rising sector in the field of medicine and surgery. The range of products available is vast, but typically they are used either in the operating theatre or on the hospital ward for the hygiene, care, and safety of staff and patients.

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Table 1: Medical textile products, raw materials and function.

	Product Name		Fiber type	Fabric type	Function
Implantable Materials	Sutures	Biodegradable	Collagen, Lacticide, Polyglycolide	Monofilament, braided	used tohold body tissues together after an injury or surgery
		Nonbiodegradable	Polyamide, Polyester, PTFE, Polypropylene, Silk	Monofilament, polyglycolide braided	Used to hold body tissues together after an injury or surgery
	Soft Tissue Implants	Artificial tendon	PTFE, polyester, polyamide, silk, polyethylene	Woven, braided	Used in Achilles tendon repair with studies on equine subjects.
		Artificial ligament	Polyester, carbon	Braided Nonwoven	An artificial ligament is a reinforcing material that is used to replace a torn ligament
		Artificial cartilage	Low-density polyethylene		To mimic the functional properties of natural cartilage in the human body.
		Artificial skin	Chitin		
		Artificial cornea	Polymethyl methacrylate, corneasilicone, collagen		The device is a huge step forward for people with corneal blindness who have rejected human tissue.
	Orthopedic implants	Artificial bones/joints	Silicone, polyacetal, Polyethylene		used in bone grafts
	Cardiovascular implants	Vascular grafts	Polyester, PTFE	Knitted, woven	Used to make a path to flow blood one area to another
		Heart valves	Polyester	Woven, knitted	Implanted in the heart of a patient with the valvular heart disease.
	Wound care	Absorbent Pad	Cotton, Viscose	Nonwoven	The functions of these materials are to provide protection against infection, absorb blood and exudate, promote healing
Non- implantable Materials		Wound contact layer	Silk, polyamide, viscose, Polyethylene	Knitted, woven, nonwoven	
	Bandages	Simple inelastic/elastic	Cotton, viscose, elastomeric yarns	polyamide, Woven, knitted, nonwoven	To hold Dressings in place over wounds.
		Light support	Cotton, viscose, elastomeric	Woven, knitted, nonwoven yarns	
		Compression	Cotton, polyamide, elastomeric yarns	Woven, knitted	
		Orthopadic	Cotton, viscose, polyester polypropylene, polyurethane foam	Woven, nonwoven	
	Plasters		Viscose, plastic film, cotton polyester, glass, polypropylene	,Knitted, woven, nonwoven	Protects the wound and scab from friction, bacteria, damage, and dirt.
	Gauzes		Cotton, viscose	Woven, nonwoven	It is especially useful for dressing wounds where other fabrics might stick to the burn or laceration
	Lint		Cotton	Woven	
	Wadding		Viscose, cotton linters, wood pulp	Nonwoven	
Extracorporeal devices	Artificial kidney		Hollow viscose, hollow		Remove waste products from patients polyester
	Artificial Liver		Hollow viscose		Separate and dispose of patients plasma, and supply fresh plasma
	Mechanical lung		Hollow polypropylene,		Remove carbon dioxide from patients hollow silicone, and supply fresh blood membrane
	Surgical clothing	Gowns	Cotton, polyester, Polypropylene	Nonwoven, woven	
		Caps	Viscose	Nonwoven	
		Masks	Viscose, polyester, glass	Nonwoven	
	Surgical covers	Drapes	Polyester, polyethylene	Nonwoven, woven	
		Cloths	Polyester, polyethylene	Nonwoven, woven	
	Bedding	Blankets	Cotton, polyester	Woven, knitted	
		Sheets	Cotton	Woven	
		Pillowcases	Cotton	Woven	
Healthcare/hygiene products	Clothing	Uniforms	Cotton, polyester	Woven	
		Protective Clothing	Polyester, polypropylene	Nonwoven	
	Incontinence diaper/sheet	Cover stock	Polyester, polypropylene	Nonwoven	
		Absorbent layer	Wood fluff Superabsorbent	Nonwoven	

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III. Surgical Suture

Surgical suture is a medical device used to hold body tissues together after injury or surgery. The application generally involves using a needle with a defined length of thread. Biocompatibility is of prime importance if the textile materials are to be accepted by the body and following four key factors will determine how the body reacts to the implants.

These are as follows:

1) The most essential factor is porosity which determines the rate at which human tissue will grow and encapsulate the implant.
2) Small circular fibers attach with human tissue better than larger fibers with irregular cross sections.
3) Toxic substances must not realease, and the fiber should be free from surface contamination like lubricants and sizing agents.
4) The property will influence the success of the implantation in terms of its biodegradability.

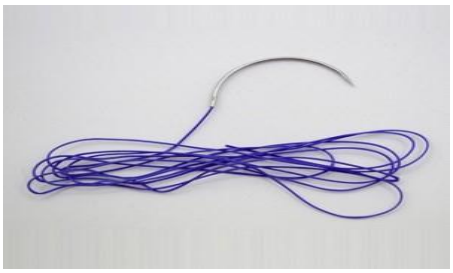


Figure 1: Surgical suture

a) Types of Sutures

There are different types of sutures.

First, Suture materials are either absorbable or nonabsorbable.

Absorbable sutures don't require to remove from body. This is because enzymes found in the tissues of the body naturally digest them.

Nonabsorbable sutures will need to be removed by your doctor at a later date or in some cases left in permanently.

Second, we can classify suture according to the actual structure of the suture material. Such as monofilament suture and braided suture. Monofilament sutures consist of a single thread. This allows the suture to pass through tissues easily. Braided sutures consist of several small threads braided together. This can lead to better security, but at the cost of the increased potential for infection.

Third, we can also classify sutures as either being made from natural or synthetic material.

b) Types of absorbable sutures

- *Gut:* This natural monofilament suture uses for repairing internal soft tissue wounds or lacerations. It shouldn't use for cardiovascular or neurological procedures. The body has the strongest reaction to this suture and will often scar over. It does not commonly use outside of gynecological surgery.
- *Polydioxanone (PDS):* This synthetic monofilament suture can use for many types of soft tissue wound repair (such as abdominal closures) as well as for pediatric cardiac procedures.
- *Poliglecaprone (MONOCRYL):* This synthetic monofilament suture uses for general use in soft tissue repair. This material shouldn't be used for cardiovascular or neurological procedures.
- *Polyglactin (Vicryl):* This synthetic braided suture is to repair hand or facial lacerations. It shouldn't be used for cardiovascular or neurological procedures.

c) Types of nonabsorbable sutures

Some examples of nonabsorbable sutures can be found below. These type uses generally for soft tissue repair, including for both cardiovascular and neurological procedures.

- *Nylon:* A natural monofilament suture.
- *Polypropylene (Prolene):* A synthetic monofilament suture.
- *Silk:* A natural braided suture.
- *Polyester (Ethibond):* A braided synthetic suture.

d) Suture Selection and Techniques

There are many different suture techniques. Some of them are:

i. *Continuous sutures*

This technique involves a series of stitches that use a single strand of suture material. This type can place rapidly and is also strong since tension is distributed evenly throughout the continuous suture strand.

ii. *Interrupted sutures*

This suture technique uses several strands of suture material to close the wound. This technique leads to a securely closed wound. If one of the stitches breaks, the remainder of the stitches will still hold the wound together.

iii. *Deep sutures*

This type places under the layers of tissue below (deep) to the skin. They may either be continuous or interrupted. This stitch is often used to close fascial layers.

iv. *Buried sutures*

This type is applied so that the suture can find inside this type of suture is typically not removed and is useful when large sutures use deeper in the body.

v. *Purse-string sutures*

This types places around an area and tightened much like the drawstring on a bag. For example, this type use in our intestines to secure an intestinal stapling device.

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vi. *Subcutaneous sutures*

This type places in our dermis, the layer of tissue that lies below the upper layer of our skin. Short stitches place in a line that is parallel to our wound.

e) Raw Materials

Natural sutures are made of catgut or reconstituted collagen, or from cotton, silk, or linen. Polyglycolic acid, a glycolide-lactide copolymer; or polydioxanone, a copolymer of glycolide and trimethylene carbonate may make synthetic absorbable sutures. Polypropylene, polyester, polyethylene terephthalate, polybutylene terephthalate, polyamide, nylons or Goretex are the raw materials of synthetic nonabsorbable sutures. S stainless steel is the raw materials of some special types of suture.

f) The Manufacturing Process

The manufacturing of sutures for surgical use is not very different from the production.

Preparation of raw polymer- Raw polymers are combined (polymerized), forced through a die and discharged as tinny pellets.

Forming individual filaments by extruder machine -The machine melts the polymer, and the liquid flows through the tiny spinneret (looking something like a shower head) forming many individual filaments.

Drawing of filaments- After extrusion, these are stretching between two rollers. It increases five times their original length.

Manufacturing of sutures- Some sutures are producing as monofilaments. Others are braided or twisted. The monofilament is winding onto bobbins, and the bobbins keep onto an automatic braiding machine.

Secondary Processing-After braiding, the suture undergoes several stages of secondary processing. Non-braided type will also go through these steps after extrusion and initial stretching. This step might take only a few minutes. The suture passes over a hot plate, and any lumps, snags, or imperfections are ironed out.

Annealing- The annealing oven subjects the suture to high heat and tension, which orders the crystalline structure of the polymer fiber into proper shape.

Coating- Absorbable coatings include Poloxamer 188 and calcium stearate with a glycolide-lactide copolymer. Nonabsorbable coating include wax, silicone, fluorocarbon.

Surgical needle preparation- The surgical needles are made at another plant, and also shipped to the finishing plant. The needles are made of fine steel wire and drilled lengthwise

Quality control-This step the suture conforms to the proper diameter, length, and strength, look for physical defects and check the dissolvability of an absorbable suture in animal and test-tube tests.

Sterilization- Next, the suture and attached needle are inserted into a foil packet and sterilized. Sterilization differs according to the suture material.

g) Suture removal

When sutures remove will depend on where they are on your body. According to American Family Physician, some general guidelines are as follows:

- Scalp: 7 to 10 days
- Face: 3 to 5 days
- Chest or trunk: 10 to 14 days
- Arms: 7 to 10 days
- Legs: 10 to 14 days
- Hands or feet: 10 to 14 days
- Palms of hands or soles of feet: 14 to 21 days

To remove sutures, the doctor will first sterilize the area. They'll pick up one end of your suture and cut it, trying to stay as close to the skin as possible. Then, they'll gently pull out the suture strand.

IV. Artificial Skin

When the skin has been damaged through disease or burns the body cannot act fast enough to manufacture the necessary replacement cells. Wounds like skin ulcers, suffered by diabetes, may not heal, and limbs must be amputated. Burn victims may die from infection and the loss of plasma.

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Artificial skin- is a collagen scaffold that induces regeneration of the skin in mammals such as humans.

The skin is the largest organ in the human body. It is made up of three layers the epidermis, dermis, and hypodermis (fat layer). The epidermis is the outer layer of skin that keeps vital fluids in and harmful bacteria out of the body. The dermis is the inner layer of skin that contains blood vessels, nerves, hair, follicles, oil, and sweet glands. Severe damage to large areas of skin exposes the human organism to dehydration and infections that can result in death.

Traditional ways to dealing with losses of the skin grafts from the patient (autografts) an unrelated donor cadaver. The former approach has the disadvantage that there may not be enough skin available, while the latter suffers from the possibility of rejection or injection until the late twentieth century skin grafts constructed from the patient skin. This method created a problem when the skin had been damaged extensively, making it impossible to treat severely injured patients entirely with outgrafts.



Figure 2: Artificial skin

a) Raw Materials

The raw materials needed for the production of artificial skin falls into two categories, those are biological components and necessary laboratory equipment. Most of the donated tissues come from neonatal foreskins removed during circumcision. One foreskin can yield enough cells to make four acres of grafting material. Manufacturer separates fibroblasts from the dermal layer of the donated tissue. Then he testes fibroblasts for viruses and other hazardous pathogens such as HIV, hepatitis B and C, and mycoplasma. The mother's medical history is recorded. The fibroblasts require to store in glass vials and frozen in liquid nitrogen at -94°F (-70°C). It should keep frozen until the fibroblasts needs to grow cultures. In the collagen method, keratinocytes are also extracted from the foreskin, tested and frozen. To grow fibroblasts on mess scaffolding need polymer in combination of molecules of lactic acid; the same elements used to make dissolving sutures. The compound undergoes a chemical reaction resulting in a larger molecule that consists of repeating structural units.

In the collagen method, a small amount of bovine collagen needs to extract from the extensor tendon of young calves. The collagen is mixed with an acidic nutrient, and stored in a refrigerator at 39.2° F (4°C).

Laboratory equipment includes glass vials, roller bottles, grafting cartridges, molds, and freezers.

b) The Manufacturing Process

The manufacturing process is deceptively simple. Its function is to trick the extracted fibroblasts into believing that they are in the human body so that they can communicate with each other in the natural way to create new skin.

i. *Mesh scaffolding method*

- In this process the manufacturer thaw and expand fibroblast. The fibroblasts need to transfer from the vials into roller bottles, which resemble liter soda bottles. Then the bottles keep their sides for three to four weeks for rotting. The rolling action allows the circulation of oxygen, essential to the growth process.
- Cells should transfer to a culture system. The cells are removed from the roller bottles, combined with a nutrient-rich media, flowed through tubes into thin, cassette-like bioreactors housing the biodegradable mess scaffolding, and sterilized with beam radiation. As the cells flow into cassettes, they adhere to the mesh and begin to grow. The cells flow back and forth for three to four weeks. Leftover suspension should remove each day as well as fresh nutrient should add. Oxygen, p^H, nutrient flow, and temperature are controlled, and temperature must control by the culture system. As the new cells create a layer of dermal skin, the polymer disintegrates.
- Growth cycle completed. When cell growth on the mesh completed, the tissue rinsed with more nutrient-rich media. Add cryoprotectant to the media. Finally cassettes store individually with label and frozen.

ii. *Collagen method*

- Cells are transferred to a culture system. A small amount of the cold collagen and nutrient media approximately 12% of the combined solution is added to fibroblasts. The mixture turns into molds and allotted to come to room temperature. As the collagen warms, its gels, trapping the fibroblasts and generating the growth of new skin cells.
- Keratinocytes added. Two weeks after the collagen added to the fibroblasts the extracted keratinocytes are thawed and seeded onto the new dermal skin. They are allowed to grow for several days and then exposed to air, including the keratinocytes to form epidermal layers.
- Growth cycle completed. The new skin is stored in sterile containers until needed.

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V. Artificial Cartilage

Artificial cartilage is a synthetic material made of hydrogels or polymers that aims to mimic the functional properties of natural cartilage in the human body. Tissue engineering principles use to create non-degradable and bio-compatible material that can replace cartilage while creating a useful synthetic cartilage material; certain challenges need to overcome. First cartilage is an avascular structure in the body, and therefore does not repair itself. This creates issues in the regeneration of the tissue. Artificial cartilage also needs to be stably attached to its underlying surface, bone lastly in the case of creating synthetic cartilage to be used in joint spaces, high mechanical strength under compression needs to be an intrinsic property of the material.

a) Components

Water (almost 80%), Chondrocytes, Collagen, Proteoglycans, Glycoproteins. Most of the synthetic cartilages are Kevlar based, or Poly Vinyl Alcohol (PVA) based.

1) *Water*- Water makes up 80% of cartilage.
2) *Chondrocytes*- Chondrocytes are the cells that produce and maintain the cartilaginous matrix. They are separately dispersed throughout cartilage and only make up 2% of the total volume of cartilage. Chondrocytes vary in size, shape, and concentration depending on their location in articular cartilage.
3) *Collagen*- Collagen is a structural protein present in the extra cellular matrix (ECM) of cartilage. Collagen is composed of a triple helix structure of polypeptide chains and offers shear and tensile properties to the cartilage ECM.
4) *Proteoglycans*- Proteoglycans are the second most abundant macromolecule ECM of cartilage. Proteoglycans consist of a linker protein along with a core protein to which glycosaminoglycans (GAGs) attach. The most common GAGs are chondroitin sulfate and keratin sulfate. Proteoglycans attach to a control chain usually hyaluronic acid, via a linker protein to create larger proteoglycan aggregates. Proteoglycans are hydrophilic and therefore attract and restrain water molecules. This provides cartilage with its intrinsic ability to resist compression.
5) *Glycoproteins*- Many other glycoproteins are present in cartilage ECM in small amounts that help maintain structure and organization. Specially-lubricin helps to create a lubricating surface on the cartilage for joint mobility. Fibronectin and integrin other glycoproteins present that help in adhesion of chondrocytes to the ECM.

b) Structure

There are structural tree zones in articular cartilage including superficial tangential zone, a transitional zone, a middle transitional zone, and a deep zone. In the transitional zone, collagen fibers are aligned parallel to the surface and become gradually randomly aligned while moving into a deep area. Collagen fibers in the suitable region are aligned parallel to the surface to restrict shear stresses. Similarly, collagen fibers are aligned perpendicular to the surface in the deep zone to restrict compressive forces. Between bone and deep zone lies calcified cartilage. Cell arrangement also varies between the zones in deeper zones chondrocytes are stacked into columns while in the superficial zones they are arranged randomly. In the superficial regions, the cells are also more entangled, while in deeper zones they are more spherical.



Figure 3: Artificial cartilage

Many people with joint injuries would benefit from a replacement for cartilage.

Articular cartilage has a characteristic shock absorbing effect attribute to its viscoelastic properties.

c) Synthetic cartilage

i. *PVA*

We use Poly (vinyl alcohol) (PVA) hydrogels in this study. It was difficult to meet the mechanical properties of articular cartilage using this hydrogel. There were no inflammatory or degenerative changes in articular cartilage or synovial membrane surround this artificial PVA cartilage. PVP hydrogels were also studied. They exhibit high hydrophilicity, biocompatibility, and complexing ability. When used as a blend of PVA/PVP hydrogel, they produced similar internal 3D structure and water content as natural articular cartilage. The best mechanical properties and friction system were blended hydrogel with one wt % PVP. Due to the inter-chain hydrogen bonding, adding PVP to the pure PVA proved a better option. They acted with a characteristic viscoelastic behavior of articular cartilage. [9]

ii. *Kevlar based*

The new Kevlar-based hydrogel recreates the magic of cartilage by combining a network of tough nanofibers from Kevlar—the "aramid" fibers best known for making bulletproof vests—with a material commonly used in hydrogel cartilage replacements, called polyvinyl alcohol, or PVA.

In natural cartilage, the network of proteins and other biomolecules gets its strength by resisting the flow

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of water among its chambers. The pressure from the water reconfigures the network, enabling it to deform without breaking. Water is released in the process, and the network recovers by absorbing water later.

VI. Artificial Ligament

Ligament is a short band of tough, flexible fibrous connective tissue which connects two bones or cartilages or holds together a joint. It is also known as articular ligament. Ligaments are generally subject to a lot of wear and tear and also carry the risk of septic arthritis. The usage of the ligament varies based on the type of operation. Ligaments are nowadays replaced artificial means through surgery. Artificial ligaments are formed by polyester, silk, Poly Tetra Fluoroethylene (PTFE). Polyethylene terephthalate- (PET-) based artificial ligaments (PET- ALs) are commonly available in anterior cruciate ligament (ACL) reconstruction surgery.

An artificial ligament is a medical device made up of textile fibers and used for joining ends of bones the requirement of a prosthetic ligament are:

- Extensive tough but have just the right stiffness to match the compliance of a ACL.
- It must have the durability to withstand high tensile loads for millions of cycles without wear.
- And it must be perfectly tolerable to the hos.

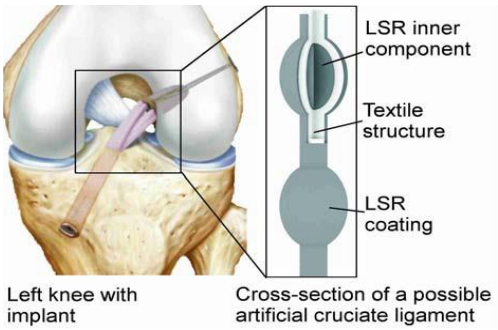


Figure 4: Artificial Ligament

There are various types of artificial ligaments in the market. The most prominent are:

a) Carbon fiber prosthetic

This type of ligament is available with carbon fiber coated with collagen, and an absorbable polymer such as polylactic acid (PLA) and polycaprolactone is a biodegradable polyester with a low melting point of around 60°C. The PLA is meant to resorb and the carbon fibers degraded as a new tissue developed encouraging tissue generation without permanently replacing it.

b) Gore-tex permanent prosthesis

The Goretex ligament prosthesis is composed of a long fiber of expanded polytetrafluoroehylene (PTFE). The ultimate strength is about three times that of human ACL and the result from cyclical creep tests and the bending fatigue testing seem to identify Gore-tex as the strong synthetic ACL replacement in terms of pure materials stability.

c) Dacron

This implant is a composite of four tightly woven polyester strips wrapped in a sheath of loosely woven structure designed to minimize abrasion of the graft and act as a scaffold for fibrous tissue in growth.

d) LEEDS-KEIO artificial ligament (Supplementary)

With the design to design a graft that combined the properties of a permanent prosthesis and a tissue-promoting scaffold, Fujikawa and seldom developed the Leeds-Keio artificial ligament a polyester mesh-like structure anchored to the femur and a tibia with a bone plugs. This mesh was intended as a scaffold for soft tissue growth through the articular and extra-articular sections of the ligaments, eventually uniting the bone plugs. The implant was considered sufficiently flexible to be suitable with a maximal tensile strength of approximate 2100 N (Newton), which significantly exceeds that of the average young adults' natural ACL (about 1730 N)

VII. Conclusion

A brief overview of the application of implantable medical textile products in various areas of medical sectors for the healthier life and betterment of human being. The development of new item will help the patients to overcome their suffering in previous days. This study provided an overview of the innovative, intelligent and smart textile products related to medical textiles, particularly implantable medical textile products such as surgical sutures, artificial skin, Artificial cartilage, and artificial ligaments.

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Gamification for Healthcare and Well-Being

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Abstract- Good health is one's greatest asset. There are many software solutions, developed to help improve the health, and well-being of people, along with them gamified software solutions are popular with their greatest effectiveness and experience compared to physical medication. While there are solutions, developed with the proper understanding of the scientific effect of such solutions to people, some are developed without any scientific analysis or proved results. This paper discusses the main health issues of humans identified within the past decade and what gamification solutions have been implemented to mitigate them and how feasible they have been. Moreover, this article discusses the future development and trends of such gamified solutions for healthcare. Compared to physical treatments and medication, gamification provides an immersive experience with the user's mind strongly connected with the gameplay, which is a great place to improve the health of a person using psychology. Many people enjoy games in their leisure time, and some use them to kill time, but games can be used for much more significant purposes connected with psychology and various functions of the human brain. Some health issues can be cured just by the perception of a person's mind since there are many hormones in the body, which reacts to countless feelings, thoughts, and sensations, that could even cure a person without medicine.

Keywords: *Concentration, Health Issues, Gamification, Obesity, Physical, Psychological, Stress.*

GJMR-K Classification: *NLMC Code: W 84.4*



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Gamification for Healthcare and Well-Being

S.W.I. Udara [α] & A. K. De Alwis [σ]

Abstract- Good health is one's greatest asset. There are many software solutions, developed to help improve the health, and well-being of people, along with them gamified software solutions are popular with their greatest effectiveness and experience compared to physical medication. While there are solutions, developed with the proper understanding of the scientific effect of such solutions to people, some are developed without any scientific analysis or proved results. This paper discusses the main health issues of humans identified within the past decade and what gamification solutions have been implemented to mitigate them and how feasible they have been. Moreover, this article discusses the future development and trends of such gamified solutions for healthcare. Compared to physical treatments and medication, gamification provides an immersive experience with the user's mind strongly connected with the gameplay, which is a great place to improve the health of a person using psychology. Many people enjoy games in their leisure time, and some use them to kill time, but games can be used for much more significant purposes connected with psychology and various functions of the human brain. Some health issues can be cured just by the perception of a person's mind since there are many hormones in the body, which reacts to countless feelings, thoughts, and sensations, that could even cure a person without medicine.

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I. Introduction

In the 21st century, people live in a digital age where they always engage with automated systems in their day-to-day activities and sometimes they even work like such automated systems within their job roles and in their personal lives. With such a lifestyle, their diet patterns, incorrect posture, amount of stress in their job roles, family responsibilities, financial responsibilities as well as depression can affect a person's physical and psychological performance negatively [1]. And since people no longer have time to think about themselves and their health, people have started ending up with various health issues in their early ages. As people of the 21st century living in the digital era where most of our day-to-day activities are related to technology, there is a greater chance to improve our health and well-being with the help of gamification to make it more appealing, interesting and effective. Because playing games are one of the activities people of all ages enjoy, and people even tend to take some time off their busy schedules to play their favorite games, some are even addicted to playing them. When a person is playing a game, it is one of the rare moments where a person's brain has a steady connection with the game play, and it is an ideal time to speak to the brain for the goodwill of improving people's health. In many scenarios, positive thinking can help heal people or at least to achieve the best state of mind, which can be very helpful for physiological diseases such as Depression and Stress [2]. The main objective of the research is to understand the effectiveness, feasibility of gamification and to understand how well they have contributed to better health and well-being by analyzing the common health issues discovered in the last decade, also this research analyzes the solutions that have already been provided using gamification. Further, this research explore how the current and future developments of technology can contribute to this field and the future trends of gamified health solutions.

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II. Literature Review

Many health problems that are most common and most dangerous identified in the last decade was due to modern lifestyles. Among them, obesity and diabetes can be recognized as one of the most risky, which could lead to other major health issues. As mentioned above with the rushed lifestyles people no longer have time to consider the quality of food or what is in the food they consume. People mostly consider the convenience, taste, and the speed of consumption, which will kill their hunger. Such practices directly lead people towards unhealthy eating habits and junk food, which if consumed regularly, could cause obesity, digestive diseases, diabetes, and even strokes. Once a person is diagnosed with diabetic; there is no complete recovery, they can only maintain their blood sugar level with medicine and food for the rest of their lives. Large amounts of money need to be spent on medication to maintain the blood sugar levels, and they cause side effects to other organs such as liver, kidneys, eyes, etc.Obesity, along with diseases such as diabetes, cholesterol, and high blood pressure, could increase the chance of getting a stroke where a person could end up paralyzed or even dead.

Most of the processes, which had to be done manually with the effort of a person, have now been automated to make them more efficient. However, at the same time, they reduce the amount of healthy exercise a person can get within a day. Most of the time people spend 8-9 hours in front of computers and some does

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not even maintain the correct posture in their seats. In the long run, such practices cause spinal health issues and could negatively affect the person's productivity within the office and at home. Technology can help with such scenarios to remind people to take breaks and to suggest simple exercise and to motivate them to move about to reduce stress on the spinal cord. It is very rarely seen kids and youth engaging in sports activities or other leisure activities since now they spend most of their time in front of a computer or using their mobile phones, which does not give them with any workout. Gamification can help them get moving and at least to provide a walking exercise to start with, and achievements and daily goals will keep them motivated to improve their health even with their busy lives.

Obesity can cause Cholesterol and increases the blood pressure in a person's body along with a high risk of getting many other diseases as well. Obesity could also lead to heart diseases where the patient's life could even be at risk. People spend a lot of money on junk food, yet they also spend an equal amount of money for the gym to burn all the fat they consumed in the first place. This not only wastes people's money but also their valuable time, which could have been used to spend with their family and friends. No matter how many new inventions and technological breakthroughs humans achieve, if they still cannot live a healthy and a happy life, none of these creations does not serve a purpose.Moreover, there are deadly diseases such as cancer which causes thousands of deaths each year, after being diagnosed the patients have to go through painful medication such as chemotherapy, which can affect such patient's mentality negatively [3]. People of all ages, including kids, are diagnosed by various types of cancers every year. Some cancers types are caused due to bad habits such as the consumption of tobacco, alcohol, chewing beetle, etc.and some are caused without the control of the patient, such as breast cancers, leukemia, brain and spinal cord tumors [4], etc.where many women and innocent children have to suffer a lot from the tough medication. Using gamification to reduce their stress level and to keep their attention away from the pain would give them the strength to overcome the discomfort at least to a certain extent.

Furthermore, the increasing aged population has started to create issues for the governments and the economy. In 2012 population over 60 years of age was 2.5 million and these figures are expected to hit 3.6 million by 2021 [5] where the government will have to consider about acquiring more medicine in the coming years, cost of free medication, pensions & benefits for the aging population. Therefore, it is wise to keep them healthy as possible right from the early stages with the help of gamification to help them get used to interacting with the technology to help them stay active. Many aging health issues are due to lack of exercise and boredom and since their mentality stuck in a perception that they are old, but once they start to interact with technology at least their brain will keep functioning just like before. Once they become old and retire from their jobs most of them will end up doing nothing but watching TV and reading a newspaper, but with 30-40 years of valuable knowledge and experience, it is a waste to see if they are not used in anyway. Using technology, we should be able to gather their knowledge and experience to help technologies like AI systems to learn and enhance it and help the younger generation live a better and intelligent life.

Below the paper discusses on how the above health issues are addressed along with gamification, which refers to the use of game elements and game design techniques in non-gaming contexts [6] or as the application of game metaphors in real life, influencing the behavior, also increasing motivation and improving the engagement [7].

a) Obesity

Today, the most common method for obesity treatment includes a combination of dieting and physical exercises. Further, the usage of weight reduction drugs to reduce appetite or to reduce fat absorption is considered as a prompt method. Moreover, people tend to undergo surgeries to remove body fat and reduce stomach volume [8]. Especially youth obesity has become so prevalent. Thus, this is a much-needed area to be addressed. In this digital era, technology has the utmost potential to rehabilitate obesity. Among them, m Health [9] is considered as a medical and public health practice supported solution, which provides information on the quality of life, well-being, motivational messages and reminders [9] and extrinsically arose the users' motivation, which will result in positive outcomes. Technology also can cater to obesity rehabilitation by offering an engaging physical activity in the form of gaming, and thereby, providing the facility on behalf of measuring various player parameters such as energy intake and consumption [8].

As discussed above, any individuals initial thought about weight loss is dieting, and this has given rise to many gamified applications on calorie and dietary control, which assists users in the form of a virtual personal trainer for weight loss [9] to motivate nutritional and behavioral changes. This area of research has been conducted with the aid of gamification and game-thinking frameworks. E.g. My Fitness Pal [9], Fat Secret [9], Noom Coach [9].

While many attempts have been made to use gaming, technological gadgets, and sensor measurements to tackle obesity; no existing work has used pervasive gaming for this purpose [8]. The study in [8] suggests a multiplayer pervasive gaming system

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with the objectives of unveiling the hidden potential within obese youth, to improve their skills, physical activities to get them healthy by real-time monitoring of bio signals and suggesting the best possible actions to assist in the rehabilitation process by providing intelligent interfaces based on the fitness, limitations, and preferences to achieve effective treatments and to involve the therapists and specialists in the rehabilitation process by letting them analyze, + and generate reports for patient management and allowing them to add or update game levels based on analysis. This gaming system mainly focuses on the "Treasury Hunt Game" [8], since it involves a reasonable amount of both physical and mental activities. However, the game is not only about finding the treasure but also about making the moves such as walking, running, cycling, etc. This ubiquitous gaming system is evolved with the aid of WBASN system framework. E.g., Playmate! [8], NEAT-o-Games [8], Pokemon-Go.

When discussing obesity or even malnutrition, the nutrition intake is a vital factor of consideration. Therefore, all the games should focus on delivering information about nutrition or should at least educate the users what is good and what is bad [10] to observe the best behavioral changes with awareness in an interactive edutainment way. Eg., In CHIANTI [10], Nutrion Rush [10].

b) Digestive health

Moreover, the awareness among children on the food they consume and the results of it should be cultivated with the aid of gamification. This will pave the way to understand the digestive system and its process and the fact that anything consumed will give reactions [11]. This will make the user understand that they should carefully choose what they consume and should always try to avoid unhealthy food [11]. E.g., NomNom [11].

c) Stress

Stress is the most effective problem to the state of mind, which might even let them give up on their lives. Thus, people tend to go for counseling, relaxing, or meditation. Stress can be healed either by recovery [1], i.e., regaining the consumed energy or coping [1], i.e., being problem or emotion-focused. Many types of research have proposed solutions for the recovery of stress by using computer/video games, but a proper solution for coping stress along with the above technologies is not yet finalized. The study in [1] suggests that this can be overcome by focusing on the individual needs from the emotional perspective using a serious game with augmented/virtual reality techniques by residing on the flow theory. Here these technologies are used because they have engagement, interaction, and immersion incorporated in them. Since different people react in different ways, and different degrees for the same stressor, it is unlikely that a single serious game is effective in all cases for all people. Therefore, by creating individual profiles and analyzing using psychology techniques, the users can be given a game that can make them achieve the flow Zone.

When a patient is revealed about their diseases, and especially if it is deadly, the patient's depression is immeasurable. The study in [12] explains how "Mission Possible" has utilized gamification to help in managing the stress of cancer survivors. This application is proposed with two main objectives, i.e., to help improve survivors' moral and decrease their worries and to monitor their health conditions by letting them indirectly answer medical questions while playing the game. Collecting data indirectly is the turning point of this study, and they perform this by rewording and mapping. Moreover, the game alters the information flow in response to the player's reply to answers [12].

d) Stroke

Stroke gives rise to key disabilities such as impaired upper limb and body imbalance hindering one's independency of performing everyday tasks [13]. Therefore, rehabilitation through regular therapy is essential, but continuously visiting therapy centers is a burden, and if this cannot be done, then the performance of, the patient drops. Along with this, serious games based on therapy (theragames) are sprouting [14]. There is a tremendous increase in motion tracking for virtual rehabilitation and the reason for being famous is not only the ability to provide a more realistic interaction but also the rise in attention, motivation, pleasure by training with virtual reality games [15] E.g. Sony Play Station Move, and Microsoft Xbox 360 Kinect. However, these solutions are lacking reported functional, validation data, and proper exercise routines to convert from conventional training. Therefore, the study in [13] presents a kinetic-based virtual reality therapy named Durian Runtuh, which utilizes the Microsoft Kinect sensor. Here, the patient needs to select one of the four different types of isolated movements recommended by the therapists and the level of difficulty, to collect falling fruits but by avoiding falling axes. This rapidly increase the recovery process of survivors, mainly because it increases the amount of time for training even without direct contact with a physiotherapist, and this in return enhances the effectiveness of the system.

e) Posture health

Correct posture directly affects one's health. A high percentage of postural diseases are occupational diseases caused due to poor working conditions. A serious game is proposed in [16], which assists the identification of several postural risk factors, the posture correction of 3D characters, and the correct positioning of equipment in the environment [16]. Moreover, it allows the memorization, the practice of motion

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sequences for stretching the joints, respectively, through a puzzle and the Microsoft Kinect device, and generates warnings emphasizing the importance of taking regular breaks from work, aiming both physiological and psychological well-being of the individual [16].

III. Future Research

Unlike software solutions for other industries, the healthcare sector requires further research and knowledge regarding the effect of such gamified programs in the real world. Moreover, when it comes to the health care sector it is not the best income producing industry among others, therefore, a considerable sum of interest is not to be seen from game developers to invest on such solutions for the sole purpose of healthcare and well-being. Mainly because almost every single business organization concentrate on maximizing profits, and requirements like these are addressed only when they need to do public relations campaigns, other than that only a few companies focus on solutions for the healthcare sector.

It is clear that no matter how good and effective a gamified solution gets if it is not affordable and has a high cost involved, then there is no use in it. However, as time passes, humans get more unhealthier due to busy schedules, bad diets, pollution, junk food, etc. Thereby, people will realize the importance of such solutions to mitigate their health problems. Because until a person is effected from a bad health condition or a disease, they would not care.

Stilla few companies have taken steps ahead and have started developing such solutions in the name of humanity to create a healthy and prosperous future. In the future, the extensive use of augmented reality and virtual reality in such gamification solutions will be visible. Moreover, they will become less device oriented and more towards blending with people's daily routines, without realizing that they are intentionally playing a game developed for healthcare and well-being. Because more indirectly the game is used, more direct the benefits will be.

IV. Conclusion

No matter the amount of technology humans have developed in the past few decades, it can be safely concluded that such gamified solutions cannot entirely heal diseases or completely mitigate health issues but instead help to minimize the impact and as a preventive action for better healthcare and well-being. In the modern age, lack of exercise, food patterns, lack of sleep, stress are a few major causes for many of the critical health issues discovered, and there are already a few gamified solutions available, which will help reduce the impact of such problems as much as possible. Some solutions are intentionally made for better health and well-being, and some are not. For example, games such as Pokemon - Go was able to unintentionally motivate people to start moving around; walking, running, and jogging to discover and collect rewards in the real world, using the real world maps and locations. Games like just dance using Xbox Kinect where the players can dance using their body movements, which unintentionally started providing at least some exercise for teenagers, and people who did not have such exercise at all in their routines. Games are loved by people of all ages, all gender, all around the world, and it is more fun, and an interactive way to improve the health and to live a healthy life in the future.

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Self Rated Assessment of Conflict at Work among Staff Nurses of Tertiary Care Hospital in Delhi

By Gurmeet Kaur, Priya Arora, Jyotismita Pathak, Tanu Anand, Rajesh Vaidya & Abhimanyu Kumar

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Method: A hospital-based cross-sectional study was carried out on 102 randomly selected staff nurses working in a tertiary care teaching hospital of Delhi. Data were collected using a pre-tested and self-administered questionnaire. Socio-demographic profile, general job information, conflict at work, and work hazards were assessed. The data was fed and analyzed using SPSS 16 software.

Results: Out of the total 102 nurses, 80% of nurses were females, and 98% were married. The mean age of the study group was 38.52 (7.107). Mean work experience in this profession was 16.40 (5.880) years, and with the present employer is 4.57 (1.680) years. Mean work duration per week is 49.90 (7.976) hours. Out of the total nurses, 45.1% agreed that there were clashes between subgroups within their group.

GJMR-K Classification: *NLMC Code: WB 310*



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Self Rated Assessment of Conflict at Work among Staff Nurses of Tertiary Care Hospital in Delhi

Gurmeet Kaur [α], Priya Arora [σ], Jyotismita Pathak [ρ], Tanu Anand [ω], Rajesh Vaidya [¥] & Abhimanyu Kumar [§]

Abstract- ***Introduction:*** Among the list of stressful professions all over the world, Nursing Profession tops the list. In most tertiary care hospitals, nurses are the ones who are most stressed out due to conflict at the workplace though working at the bottom of the hierarchy. There is a lack of data on stress among nurses due to conflicts at work and other work-related issues, which led to this study.

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Results: Out of the total 102 nurses, 80% of nurses were females, and 98% were married. The mean age of the study group was 38.52 (7.107). Mean work experience in this profession was 16.40 (5.880) years, and with the present employer is 4.57 (1.680) years. Mean work duration per week is 49.90 (7.976) hours. Out of the total nurses, 45.1% agreed that there were clashes between subgroups within their group. 42.1 % agreed that there is 'we' feeling among members of their group, 42.1% agreed on a difference of opinion among members of their group and 43.1% revealed that the relationship between my group and other's groups is harmonious in attaining the overall organizational goals.

Conclusion: More than half of the total nurses reported stress due to conflict at work, and this suggests the need for empowering staff nurses regarding skills of resolution of conflict at the workplace.

I. Introduction

Stress is one of the leading causes of morbidities prevalent worldwide thereby leading to disabilities. Certain fearsome and disturbing environmental factors lead to Stress in the form of the psychological and physiological response of the human body. One of the most important sources of stress in people's lives is Occupation. For every individual, social recognition, social requirements, and social contact are achieved by their occupation; therefore, it is thought to be an important factor causing stress. (1)

As per the definition is given by Cooper, Occupational Stress is the result of the interaction between the individual and the work environment. (2) Factors such as work overload, conflict at work, no autonomy, long working hours, abusive administration, poor relationship with coworkers, lack of promotions, etc. have been recognized causes of occupational stress. (3)

Nursing profession gives immense satisfaction and accomplishment. But often it can also be enormously stressful. In India, the nurse to patient ratio is considerably low (1:2250), thereby overstraining of nurses often occurs. Along with other health care professionals, they share responsibility for the treatment, safety, and recovery of patients with acute or chronic illness, injuries, restoration of health, management of life-threatening emergencies and Research pertaining to the medical and nursing profession. Nurses sincerely not only fulfill the role of care-providers but also act as managers and superiors of patients (4). Nursing Staff acquires a substantial amount of Stress while fulfilling these roles at work (5), especially those working at the bottom of the Hospital pyramid (6) such as staff nurses and nursing brothers, who procure the maximum work burden. Nurses working in tertiary care hospitals exhibit more stress and lower levels job satisfaction and quality of work life than others. (7) It has been observed that nurses working in public hospitals are more stressful than those working in private hospitals.(8)Rotating hours duties, time-bound demands, disrespectful behavior of patients, doctors and hospital management, scanty staff, interpersonal relations, conflict at work, mortalities around and less salary drastically add to their stress levels. (5, 9) Nursing profession is considered a high-risk profession in regards to stress associated morbidities. (10) It is therefore of utmost importance to estimate the magnitude of stress specifically among those working in tertiary care government hospitals and identify the etiology behind it. It will help in rationalizing the stress management initiatives towards a definite course, thereby warranting that health caregivers remain healthy and stress-free which will lead to efficient delivery and improved quality of health services for the population at large. Thus, this study aimed to find out the prevalence of stress due to conflict at work among nurses and the factors associated with it. The role of a demographic variable was also assessed.

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II. Methodology

a) Study Setting and Study Participants

This was a hospital-based cross-sectional study carried out among nursing personnel in a tertiary care hospital catering to a large population of Delhi and nearby states. Out of the total 2190 staff nurses and nursing sisters (junior nursing staff), 102 were randomly selected nursing personnel, aged between 18years to 60 years who were working in the hospital for at least 1 year, were free from physical disease, no history of neurological or psychiatric diseases and no drug addiction were included in the study. Nurses who were not willing to complete the questionnaire were excluded. This sample was calculated on the basis of expected prevalence of stress among nurses, which was 60% (11); the worst acceptable prevalence was taken as 50% with a 95% confidence interval. Nurses were also stratified according to their joining date in order to achieve adequate randomization. From each work-station, participants were selected using a random numbers' table. Informed consents were obtained before getting their personalized responses. Selected nursing personnel were contacted and informed consent was obtained from each participant before data collection.

b) Study Tool

A pretested, self-administered, structured questionnaire was used for data collection. It included items to record socio-demographic characteristics and assess the presence of factors regarding stress among the nursing personnel. The questionnaire contained items to assess Stress due to Conflict at work and its associated factors which are issued by The National Institute for Occupational Safety and Health (NIOSH). A questionnaire is a screening tool for identifying the stressors at work leading to stress. Questions to assess Stress among Nurses working in tertiary care hospitals along with their socio-demographic profile and job specifications were included based on a literature review. (12) The questionnaire was reviewed for suitability, relevance, and accuracy in the Indian context. It was pretested in the English language with ten staff nurses and was suitably modified. Internal consistencies of the items on Stress due to conflict at work were obtained through a Cronbach's alpha coefficient (0.90). The questionnaire was divided into 3 sections. The first section consisted of 4 questions pertaining to the sociodemographic profile of nurses. The second section consisted of General Job Information including work experience, job title, job situation, work shift, and rotation patterns and the third section consisted of 16 questions to screen for work situation associated with Stress due to conflict at work. The degree and quantification of stress due to conflict at work was assessed by a scoring system based on the 5 point 'Likert Scale' such as 1. Strongly Agree (Classified as No Stress); 2. Moderately Agree (Mild Stress); 3. Neither agree nor disagree (Moderate Stress); 4. Moderately Disagree (Severe Stress); 5. Strongly Disagree (Extreme Stress). Nurses were asked to grade individual conditions, which may contribute to stress in their daily life due to conflict at work. The questionnaire contained 16 possible conditions that may act as sources of stress in their day-to-day life due to conflict at work and nurses were asked to grade them on a scale of 1 to 5. '1' was assigned to a particular condition considered a source of no stress and 5was given to a particular condition with stress of the highest degree. The scores given by each nurse to all the given stressors in their daily life were then summed up to obtain a stress score for each participant. The minimum score that could be obtained by each nurse would be 16(16 X 1), and the maximum would be 80 (16 X 5). On the basis of this score, the stress in everyday life of nurse was classified as: no stress: 16, mild stress: 17 to 32, moderate stress: 33to 48, severe stress: 49 to 64 and Extreme Stress: 65 to 80. Individual score for each stressor was also calculated by summing the score given by each nurse to a single stressor. Therefore for each stressful condition, the minimum score obtained was (1 X 102) '102' and the maximum score was (5X102) '510'. This was done to determine what sources were the most significant contributors to stress in nurses'lives due to conflict at work.

c) Survey Procedure

Questionnaires were distributed to the study subjects after obtaining written informed consent. The subjects were given between 15 and 30 minutes to complete the questionnaires. The questionnaires were scrutinized at the time of collection and if any information was missing, nurses were asked again for that information to be completed.

d) Analysis

Data were entered in Microsoft Excel and transferred into SPSS version 17 for analysis. Findings were presented as group proportions, and a difference in proportions for a given factor was assessed by the Chi-square test. A P value cut off for statistical significance was set at 0.05. Factors which were significantly associated ($P < 0.05$) with Conflict at work in univariate analysis were further analyzed in Binomial Logistic regression analysis. Odds Ratios (ORs) were calculated indicating the relative odds of occurrence of stress due to conflict at work due to the presence of a particular factor.

e) Ethical Issues

All nursing staff who participated in the study were informed about the purpose of the study and full free and voluntary consent was taken before their inclusion. Each nurse who participated in the study was free to withdraw from the study at any point in time and

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was ensured confidentiality of the responses. The study was approved by the institutional ethics committee of the medical college.

f) Results

Table 1 shows the characteristics of Stress due to Conflict at Work of the revised NIOSH generic questionnaire. Out of the total 102 nurses, 80% of nurses were females and 98% were married. The mean age of the study group was 38.52 (7.107). Mean age of nurses found with severe stress included 39.67 years. Mean work experience in this profession was 16.40 (5.880) years and with the present employer is 4.57(1.680) years. Out of the total, 75.5% were a full-time permanent employee and 38.2% had permanent day shift. Mean work duration per week is 49.90 (7.976) hours. All the nurses (100%) found their jobs stressful with 54.9% reported severe or extreme stress. Among the total nurses, 73.5% agreed there was dissension in the group and 70.6% agreed that other groups created problems for their group while 45.1% agreed that there were clashes between subgroups within their group. 42.1% agreed that there is 'we' feeling among members of their group, 42.1% agreed on a difference of opinion among members of their group and 43.1% revealed that the relationship between my group and others groups is harmonious in attaining the overall organizational goals. Table 2 describes the job profile of Staff Nurses, Out of 102 total nurses 81.3% were staff nurses while 18.6% were nursing sisters of which 50.1% have worked for more than 5 years in the present institution with 76.6% had overall work experience of less than 20 years. 83.3% work as permanent employees with 67.6% work in permanent work shift while 32.3% work in rotating work shifts and 68.6% have been working in their same shift from more than 2 years. 34.3% rotated in no set pattern while 30% rotated in 8hour shift Night to evening to Day. 27.5% agreed they changed their shift twice a week and 24.5% agreed they changed their shift more than twice a week. 76.1% work between 46-68 hours per week.

Table 3 shows the sources of Conflict at work with their percent scores. Out of the given possible sources of stressors leading to conflict at Work, Dissension in group and withholding information among members was considered most stressful while agreement among members was considered least stressful. On univariate analysis Table, 4 shows that possible stressors associated with Conflict at work include age (OR=0.56, 95%CI=0.248-1.268, p value<005) increasing age group is less likely to have conflict at work as compared to younger age group, disputes among group members.(OR=0.57, 95%CI 0.25-1.30, p-value <0.05), lack of mutual assistance (OR=0.38, 95% CI 0.15-0.91 p value<0.05) and rotation patterns (OR=5.62, 95% CI=0.60-52.71, p-value <0.05) are found to be associated with Conflict at work which was found to be statistically significant. To understand the co-association of various risk factors in the current occurrence of conflict at work among nurses, logistic regression analysis was done. The outcome variable was conflict at work as present or absent. Independent variables with P<0.05 in univariate analysis were entered into the model. The Binary Logistic regression analysis showed the model was statistically significant, p<0.005. The model explained 21.9% (Nagelkerke R2) of the variance in Stress with Conflict at work and correctly classified 56.8% of nurses. Among all the factors, Lack of mutual Assistance was found to be associated with Stress due to Conflict at work which was proven with statistical significance (p value<0.01).

III. Discussion

This study showed that the selected scales of the NIOSH generic job stress questionnaire differed for groups according to age, marital status, work experience, work duration and work shift among staff nurses working in a tertiary care hospital. All the nurses reported stress in the present study. However, the very high levels of work stress were found in 54.9% nurses, which is similar to a survey conducted in 2013 among Nigerian nurses, where 52.3% of nurses reported 'high work stress'. Other studies have also found a similar stress level. 13, 14 No statistically significant difference was found between stress levels in this hospital, thereby suggesting that stress levels are not influenced by the type of hospital and stress management programs should focus on nursing occupation holistically irrespective of type of setting.

Although there is no statistical significance, married nurses were found being more stressed than those who were unmarried. This could suggest that the additional responsibility of married life may increase their stress levels. On contrary Callaghan et al 6 reported that single nurses had marginally higher stress scores than married nurses. This was again not statistically significant. Hence, to ascertain the association between marital status and stress further studies are required.

It was found in our study that with increasing age more nurses were stressed although Increasing age and longer duration of the job did not have a statistically significant relationship with job stress. However other studies have demonstrated that increasing age and longer duration of job lead to increased stress. (15) (16) Therefore, it would be mandatory to adopt the issue of stress management early in the career of nurses to prevent unfavorable consequences later.

In accordance with the findings of Keinan et al, who concluded that stress has a negative effect on decision making. (17) This study also highlights the perceived inability of 56.9% of the nurses to efficiently handle other stressful events in there in order to achieve

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harmonious goals for the organization. This reveals the adverse effect of stress on nurses' everyday life and the need for an efficient stress management system in order to improve the overall quality of life of the nurses. The important stressors have also been established by past studies. (4, 8, 18, 19, 20). The contribution of various stressors assessed by the study has established a Pyramid of precedence with which each of these must be tackled individually while conniving stress management programs in the Indian setting. An effective stress management program is especially achievable in a tertiary care setting where chains of training programs related to the nursing profession are conducted regularly. Workplace stress management program is a cost effectual psycho-educational intervention. (21). Some other alternative administrative interventions could be undertaken to increase the employment of nurses so that our nurses are not overloaded. Paperwork can be imparted upon an administrative staff. Equitable distribution of shift schedule, as well as regular biweekly or monthly meetings by senior nurses and supervisors to discuss various issues causing stress to nurses, are some of the measures that can be undertaken to de-stress the nurses. Problem fixated and emotion-focused coping mechanisms are suggested for tackling the individual's perception of stress (22).

The study has shown that nearly two-fifth of nurses employ positive approach towards stress like Friendliness among all (37.3), we feeling among all (42.2), an agreement among all (21.5) which can be perceived as a common coping strategy amongst nurses which are consistent among Studies elsewhere (5, 19, 30). Such methods should be encouraged in stress management programs. Also, a large majority did not resort to negative methods like smoking, drinking or taking drugs. This could be due to the presence of social norms in Indian society and must be encouraged further.

One of the limitations of the study was that since stress had no objective definition or criteria; hence different subjects may have interpreted it differently. Only a limited domain of stress was determined as the goal of the study was broad-based and descriptive. Although stratification was done to achieve equal representation from all workstations, the sample size of 102 may not reflect the true situation. Moreover, results were based on observation over the study period, which may vary over different periods of time. The authors firmly believe that the above limitations have not defeated the purpose of the study.

IV. Conclusion

This study has provided an insight into the problem of occupational stress amongst nurses and deciphered the factors responsible for the same. It has also attempted to establish a hierarchy of priority, with which the stressors operational in the nurses' life as well as an occupation should be tackled in stress management programs. This should give a proper direction and aid in designing an efficient stress management programs for them. These findings may go a long way in improving the mental health and stress levels of nurses and thereby enabling them to provide better patient care.

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Table 1: (A) Distribution of subjects as per their responses

		N	%
Gender	Male	20	19.6
	Female	82	80.4
Marital status	Married	100	98
	Unmarried	2	2
Harmony among all	Disagree	57	55.9
	Agree	45	44.1
Bickering among the group	Disagree	60	58.8
	Agree	42	41.2
Difference in opinion among members	Disagree	48	57.8
	Agree	54	42.2
Supportive for each other	Disagree	59	57.8
	Agree	43	42.2
Clashes among members	Disagree	56	54.9
	Agree	46	45.1
Friendliness among members	Disagree	64	62.7
	Agree	38	37.3
We Feeling among all	Disagree	59	57.8
	Agree	43	42.2
Disputes among all	Disagree	56	54.9
	Agree	46	45.1
Agreement among all	Disagree	80	78.4
	Agree	22	21.6
Withholding Information from colleagues	Disagree	55	53.9
	Agree	47	46.1
Harmonius in attaining organizational goals	Disagree	58	56.9
	Agree	44	43.1
Lack of mutual assistance	Disagree	65	63.7
	Agree	37	36.3
Cooperation among members	Disagree	59	57.8
	Agree	43	42.2
Personality clashes among members	Disagree	59	57.8
	Agree	43	42.2
Create problems for each other	Disagree	56	54.9
	Agree	46	45.1

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Table 1: (B) Characteristics of the subjects

	Mean (SD)	Those who agreed (%)
Age(years)	38.52 (7.107)	
Work Experience(years)	16.40 (5.880)	
Work duration per week(hours)	49.90 (7.976)	
Harmony within my group	3.28 (1.084)	44.1
Bickering over work	3.08 (1.183)	63.7
Difference in opinion	3.17 (1.178)	69.6
Dissension in my group	3.29 (1.182)	73.5
Supportive of each other	3.19 (1.175)	42.2
Clashes between subgroups	3.27 (1.244)	45.1
Friendliness among members	3.06 (1.106)	37.2
"we" feeling among members	3.18 (1.164)	42.2
Disputes within groups	3.39 (2.368)	45.1
Agreement among members	2.58 (1.076)	21.5
With-holding information among groups	3.29 (1.059)	46.0
Harmony in attaining overall organizational goals	3.14 (1.21)	43.1
Lack of mutual assistance	3.01 (1.173)	36.3
Cooperation between groups	3.20 (1.108)	42.2
Personal clashes	3.23 (1.142)	42.2
Create problems	3.21 (1.180)	70.6

Table 2: Distribution of socio-demographic profile & job profile of subjects

Gender	Male	19.6%
	Female	80.4%
Marital status	Married	98%
	Unmarried	02%
Age	25-40 years	62.7%
	41-60 years	37.3%
Children	Less than 2	88.2%
	More than 2	9.8%
Work experience with present employer	Less than 5 years	50%
	More than 5 years	50.1%
Job title	Staff Nurse	81.3%
	Nursing sisters	18.6%
Overall work experience	Less than 20 years	76.6%
	More than 20 years	15.8%
Job situation	Permanent employee	83.3%
	Temporary employee	16.7%
Work Shift*	Permanent	67.6%
	Rotating	32.3%
Working in this shift**	Less than 2 years	31.4%
	More than 2 years	68.6%
Work duration per week	25-45 hrs	23.9%
	46-68 hrs	76.1%

* 34.3%rotated in no set pattern while 30% rotated in 8hour shift Night to evening to Day.
**27.5% agreed they changed their shift twice a week and 24.5% agreed they changed their shift more than twice a week.

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Table 3: Scores for various sources of conflict at work leading to Stress among Nurses

Possible source of conflict at work	Degree of Stress:1=No stress and 5= Extreme stress					Total stress score for this source	Percent score of the highest stress
	1 n (%)	2 n (%)	3 n (%)	4 n (%)	5 n (%)		
Harmony within my group	5 (4.9)	20 (19.6)	32 (31.4)	31 (30.4)	14 (13.7)	335	65.7
Bickering over work	9 (8.8)	28 (27.5)	23 (22.5)	30 (29.4)	12 (11.8)	314	61.6
Difference in opinion	9 (8.8)	22 (21.6)	28 (27.5)	29 (28.4)	14 (13.7)	293	57.4
Dissension in my group	10 (9.8)	17 (16.7)	21 (20.6)	41 (40.2)	13 (12.7)	336	65.9
Supportive of each other	8 (7.8)	23 (22.5)	28 (27.5)	28 (27.5)	15 (14.7)	325	63.7
Clashes between subgroups	10 (9.8)	18 (17.6)	28 (27.5)	26 (25.5)	20 (19.6)	334	65.5
Friendliness among members	9 (8.8)	23 (22.5)	32 (31.4)	29 (28.4)	9 (8.8)	312	61.2
“we” feeling among members	10 (9.8)	18 (17.6)	31 (30.4)	30 (29.4)	13 (12.7)	324	63.5
Disputes within groups	10 (8.8)	21 (20.6)	26 (25.5)	32 (31.4)	13 (12.7)	323	63.3
Agreement among members	18 (17.6)	32 (31.4)	30 (29.4)	19 (18.6)	3 (2.9)	263	51.6
With-holding information among groups	3 (2.9)	24 (23.5)	28 (27.5)	34 (33.3)	13 (12.7)	336	65.9
Harmony in attaining overall organizational goals	12 (11.8)	19 (18.6)	27 (26.5)	31 (30.4)	13 (12.7)	320	62.7
Lack of mutual assistance	13 (12.7)	20 (19.6)	32 (31.4)	27 (26.5)	10 (9.8)	307	60.2
Cooperation between groups	7 (6.9)	21 (20.6)	31 (30.4)	31 (30.4)	12 (11.8)	326	63.9
Personality clashes	7 (6.9)	21 (20.6)	31 (30.4)	28 (27.5)	15 (14.7)	329	64.5
Create problems for each other	9 (8.8)	21 (20.6)	26 (25.5)	32 (31.4)	14 (13.7)	327	64.1

Table 4: ORs of individual factors with conflict at work

Univariate analysis			
	OR	95% CI	P value
Age	0.561	0.24-1.26	<0.05
Marital status	1.439	0.87-23.67	>0.05
Difference in opinion	0.635	0.28-1.42	>0.05
Disputes among group	0.577	0.25-1.30	<0.05
Lack of Mutual assistance	0.382	0.15-0.91	<0.05
Personality clashes	1.462	0.65-3.25	>0.05
Withholding information	0.802	0.36-1.77	>0.05
Rotation pattern	5.625	0.60-52.71	<0.05
Harmony in group	0.917	0.41-2.03	>0.05
Friendliness in group	0.523	0.22-1.21	>0.05
“we feeling” amongst all	1.462	0.65-3.25	>0.05
Supportive of each other	0.889	0.39-1.97	>0.05
Agreement amongst all	0.600	0.22-1.63	>0.05
Dissension in group	0.695	0.31-1.53	>0.05
Work-shift	0.800	0.33-1.88	

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Table 5: Binomial Logistic Regression analysis of Conflict at work among Nurses

	coefficient	S.E	Wald	d.f	P value	Odds Ratio	95% Confidence Interval	
							Lower	Upper
Lack of Mutual Assistance	-1.399	0.549	6.489	1	0.01	0.24	0.84	0.72
Age	1.188	0.509	5.458	1	0.01	3.28	1.21	8.89
Constant	1.105	0.729	2.297	1	0.13	3.019		

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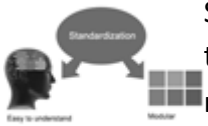


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"

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f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

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19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon 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 for 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 of 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 criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to 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 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.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

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

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite 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 approaches 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. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a 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 limit the initial two items to no more than one line each.

Reason for writing the article—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 for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity 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 of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets 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 for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory 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 soundly written procedures segment allows a capable scientist to replicate 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 to give the least amount of information that would permit another capable scientist to replicate 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 section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show 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:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the 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—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and 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.



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Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as 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. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give 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 manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit 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 section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an 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 implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully 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 the prospect, and let it drop at that. Make a decision as to whether each premise is supported or 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 an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of 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 other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

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Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

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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

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