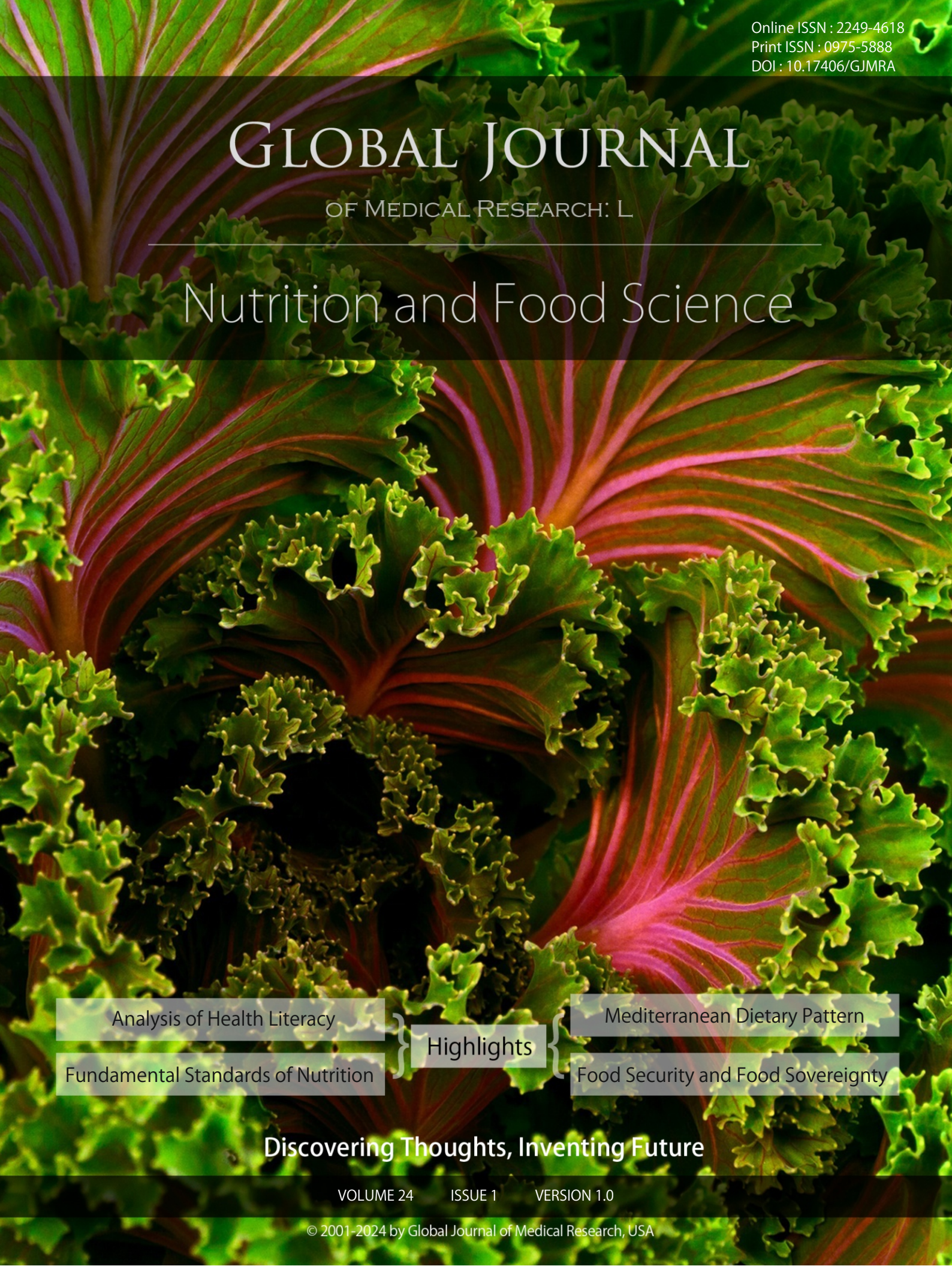
Online ISSN : 2249-4618
Print ISSN : 0975-5888
DOI : 10.17406/GJMRA

Global Journal

of Medical Research: L

Nutrition and Food Science



Analysis of Health Literacy

Fundamental Standards of Nutrition

Highlights

Mediterranean Dietary Pattern

Food Security and Food Sovereignty

Discovering Thoughts, Inventing Future

VOLUME 24 ISSUE 1 VERSION 1.0

Global Journal of Medical Research: L
Nutrition & Food Science

Global Journal of Medical Research: L
Nutrition & Food Science
Volume 24 Issue 1 (Ver. 1.0)

Open Association of Research Society

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

Global Journals Inc.

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

Sponsors: Open Association of Research Society
Open Scientific Standards

Publisher's Headquarters office

Global Journals® Headquarters
945th Concord Streets,
Framingham Massachusetts Pin: 01701,
United States of America
USA Toll Free: +001-888-839-7392
USA Toll Free Fax: +001-888-839-7392

Offset Typesetting

Global Journals Incorporated
2nd, Lansdowne, Lansdowne Rd., Croydon-Surrey,
Pin: CR9 2ER, United Kingdom

Packaging & Continental Dispatching

Global Journals Pvt Ltd
E-3130 Sudama Nagar, Near Gopur Square,
Indore, M.P., Pin:452009, India

Find a correspondence nodal officer near you

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

eContacts

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

Pricing (Excluding Air Parcel Charges):

Yearly Subscription (Personal & Institutional)
250 USD (B/W) & 350 USD (Color)

Editorial Board

Global Journal of Medical Research

Dr. Han-Xiang Deng

MD., Ph.D
Associate Professor and Research Department
Division of Neuromuscular Medicine
Davee Department of Neurology and Clinical Neurosciences
Northwestern University Feinberg School of Medicine
Web: neurology.northwestern.edu/faculty/deng.html

Dr. Pina C. Sanelli

Associate Professor of Radiology
Associate Professor of Public Health
Weill Cornell Medical College
Associate Attending Radiologist
NewYork-Presbyterian Hospital
MRI, MRA, CT, and CTA
Neuroradiology and Diagnostic Radiology
M.D., State University of New York at Buffalo,
School of Medicine and Biomedical Sciences
Web: weillcornell.org/pinasanelli/

Dr. Roberto Sanchez

Associate Professor
Department of Structural and Chemical Biology
Mount Sinai School of Medicine
Ph.D., The Rockefeller University
Web: mountsinai.org/

Dr. Michael R. Rudnick

M.D., FACP
Associate Professor of Medicine
Chief, Renal Electrolyte and Hypertension Division (PMC)
Penn Medicine, University of Pennsylvania
Presbyterian Medical Center, Philadelphia
Nephrology and Internal Medicine
Certified by the American Board of Internal Medicine
Web: uphs.upenn.edu/

Dr. Feng Feng

Boston University
Microbiology
72 East Concord Street R702
Duke University
United States of America

Dr. Seung-Yup Ku

M.D., Ph.D., Seoul National University Medical College,
Seoul, Korea Department of Obstetrics and Gynecology
Seoul National University Hospital, Seoul, Korea

Dr. Hrushikesh Aphale

MDS- Orthodontics and Dentofacial Orthopedics.
Fellow- World Federation of Orthodontist, USA.

Santhosh Kumar

Reader, Department of Periodontology,
Manipal University, Manipal

Gaurav Singhal

Master of Tropical Veterinary Sciences, currently pursuing Ph.D in Medicine

Dr. Aarti Garg

Bachelor of Dental Surgery (B.D.S.) M.D.S. in Pedodontics and Preventive Dentistr Pursuing Phd in Dentistry

Sabreena Safuan

Ph.D (Pathology) MSc (Molecular Pathology and Toxicology) BSc (Biomedicine)

Getahun Asebe

Veterinary medicine, Infectious diseases, Veterinary Public health, Animal Science

Dr. Suraj Agarwal

Bachelor of dental Surgery Master of dental Surgery in Oromaxillofacial Radiology.
Diploma in Forensic Science & Oodntology

Osama Alali

PhD in Orthodontics, Department of Orthodontics, School of Dentistry, University of Damascus. Damascus, Syria. 2013 Masters Degree in Orthodontics.

Prabudh Goel

MCh (Pediatric Surgery, Gold Medalist), FISPU, FICS-IS

Raouf Hajji

MD, Specialty Assistant Professor in Internal Medicine

Surekha Damineni

Ph.D with Post Doctoral in Cancer Genetics

Arundhati Biswas

MBBS, MS (General Surgery), FCPS, MCh, DNB (Neurosurgery)

Rui Pedro Pereira de Almeida

Ph.D Student in Health Sciences program, MSc in Quality Management in Healthcare Facilities

Dr. Sunanda Sharma

B.V.Sc.& AH, M.V.Sc (Animal Reproduction, Obstetrics & gynaecology), Ph.D.(Animal Reproduction, Obstetrics & gynaecology)

Shahanawaz SD

Master of Physiotherapy in Neurology PhD- Pursuing in Neuro Physiotherapy Master of Physiotherapy in Hospital Management

Dr. Shabana Naz Shah

PhD. in Pharmaceutical Chemistry

Vaishnavi V.K Vedam

Master of dental surgery oral pathology

Tariq Aziz

PhD Biotechnology in Progress

Contents of the Issue

Global Journal of Medical Research: L
Nutrition & Food Science
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Characterization and Analysis of Health Literacy and Adherence to the Mediterranean Dietary Pattern in Senior University Students

By Joana Rodrigues, Madalena Azaruja, Helena Loureiro & João Paulo Figueiredo

Abstract- *Introduction:* Low Health Literacy is associated with worse health outcomes, especially in the elderly, an age group with high representation in Portugal. Diet is another factor that influences health outcomes and is essential for healthy aging. Thus, these are two relevant concepts for monitoring and intervention by health professionals.

Purpose: To verify if there is a correlation between the Health Literacy levels and the level of Adherence to the Mediterranean Dietary Pattern in students from Senior Universities and to analyze the possible impact of sociodemographic factors on these variables.

Materials and Methods: The study sample was constituted by 114 students registered in Portuguese Senior Universities, in the Central Zone and Metropolitan Area of Lisbon. Participants were aged between 54 and 88 years old, with 79 individuals being female and the remaining 35 male.

Keywords: *predimed, health literacy, mediterranean dietary pattern, senior universities, seniors*

GJMR-L Classification: *NLMC Code: W20.5*

Characterization and Analysis of Health Literacy and Adherence to the Mediterranean Dietary Pattern in Senior University Students

Joana Rodrigues [α], Madalena Azaruja [σ], Helena Loureiro [ρ] & João Paulo Figueiredo [ω]

Abstract- ***Introduction:*** Low Health Literacy is associated with worse health outcomes, especially in the elderly, an age group with high representation in Portugal. Diet is another factor that influences health outcomes and is essential for healthy aging. Thus, these are two relevant concepts for monitoring and intervention by health professionals.

Purpose: To verify if there is a correlation between the Health Literacy levels and the level of Adherence to the Mediterranean Dietary Pattern in students from Senior Universities and to analyze the possible impact of sociodemographic factors on these variables.

Materials and Methods: The study sample was constituted by 114 students registered in Portuguese Senior Universities, in the Central Zone and Metropolitan Area of Lisbon. Participants were aged between 54 and 88 years old, with 79 individuals being female and the remaining 35 male. It was applied to a sociodemographic questionnaire, the PREDIMED questionnaire, to assess adherence to the Mediterranean Dietary Pattern, and the HLS-EU-PT questionnaire to assess the level of health literacy. For statistical treatment, SPSS software version 27.0 was used.

Results: There were no significant results, however it was verified that most participants had a "problematic" level of Health Literacy and "low adherence" to the Mediterranean Dietary Pattern.

Conclusions: It is necessary to carry out more studies on this topic and more Health Education Programs, in order to highlight their needs and advantages, with the aim of promoting the population's health.

Keywords: predimed, health literacy, mediterranean dietary pattern, senior universities, seniors.

I. Introduction

Health Literacy (HL) is defined by the World Health Organization (WHO) as the "set of cognitive and social skills and the person's ability to access, understand, evaluate and apply health information, in order to promote and maintain a good health"(1). It is already clear that a low HL is associated with worse health outcomes, particularly affecting minority populations, the elderly, people with a lower educational level and/or lower incomes. (2,3).

It is known that the Portuguese population is represented by a high percentage of elderly people, one of the groups with the lowest Health Literacy and worst health outcomes. From 2001 to the present (data from 2021), the age groups from 0 to 64 years old have decreased, while the group aged 65 and over has seen an increase of almost 4% (4.5). This aging pattern is common throughout Western Europe. In 2015, the growth of the age group of people aged 65 and over, in Portugal, ranked 10th, compared to other European countries. Projections predict that we will continue to see a clear worsening of the demographic aging process until 2080 (6). Therefore, working in this age group in Portugal becomes emerging, as it constitutes a considerably large and vulnerable group.

Despite the lack of attention given to this issue, UNESCO has already highlighted for about 30 years the importance of promoting educational and cultural activities for retired and/or elderly people, with the aim of ensuring them a better quality of life and also to ensure that societies benefit from their long experience. Local entities are therefore challenged to ensure the promotion of this type of activities for the senior population, in order to promote active ageing (6).

As nutrition is a crucial part of good health, it plays a decisive role in these results. Several studies have shown that there is a relationship between the Mediterranean Dietary Pattern and good health, since some components of this dietary pattern have been associated with a longer life expectancy and a lower incidence of chronic diseases. Thus, it has been possible to find an association between lower overall mortality and mortality from coronary heart disease and a longer life expectancy in Mediterranean countries (7).

These are two concepts of high importance and emergence of action, and the question also arises as to whether they are related in any way, since Health Literacy can influence health choices and habits, which may include food choices.

Author α σ: 4th year student of the Degree in Dietetics and Nutrition at the Escola Superior de Tecnologia da Saúde de Coimbra. e-mail: madalena.azaruja@gmail.com

Author ρ: Advisor, Adjunct Professor, Department of Dietetics and Nutrition, Coimbra Higher School of Health Technology.

Author ρ ω: Full Professor of Applied Research in Dietetics and Nutrition of the Degree in Dietetics and Nutrition of the Higher School of Health Technology of Coimbra.

Author: Co-supervisor Adjunct Professor of the Department of Complementary Sciences and Adjunct Professor at the Higher School of Health Technology of Coimbra.

a) *Background*

i. *Health Literacy*

The most recent data regarding HL in Portugal, obtained after the evaluation carried out by the General Directorate of Health, between 2020 and 2021, within the scope of the Action Plan for Health Literacy 2019-2021, and framed in the consortium European "WHO Action Network on Measuring Population and Organizational Health Literacy" (M-POHL), reveal that 65% of respondents had "Sufficient" knowledge and only 5% had an "Excellent" level. It was also possible to understand that 22% and 8% revealed "Problematic" and "Inadequate" levels, respectively. In general, and compared to other European countries, such as Germany, Spain or Greece, Portugal had relatively lower Health Literacy rates. (1.8). Through the "Synthesis Report - Health Literacy in Portugal" from the Calouste Gulbenkian Foundation, from 2016, it is possible to verify that individuals aged 66 or over represent a vulnerable group with regard to this topic (8).

Knowledge, motivation and personal skills are essential for a good understanding of information and consequently improving HL. In turn, the level of this knowledge will also determine access to healthcare (1). Social determinants such as ethnicity, socioeconomic level, gender differences, culture, language and even academic qualifications have an influence on the level of HL. Thus, individuals with a low socioeconomic level and a low level of education have lower health knowledge, which in turn limits participation in disease screening and generates less understanding of the information received about a disease and its respective treatment (9). Therefore, it is of great importance to measure HL levels in populations, in order to constitute a starting point for planning health interventions as well as to support policies aimed at the specific characteristics of the population and respective knowledge (1).

It is possible to assess the relationship between food choices, whether at an individual, community or global level, and factors such as social context, food availability, policy formulation, marketing strategies, food prices, and food literacy (FL) levels (10). It has been proven that adults with low LS have greater difficulty in understanding issues in the area of Nutrition, such as following nutritional recommendations from health professionals, reading food labels and thus making informed decisions when purchasing these products (9). According to the Global Burden of Disease study, in 2019, the eating habits of the Portuguese represented the fifth risk factor that most contributed to the loss of years of healthy life due to illness. This increase in food-related illnesses has been associated with poor eating habits and low levels of knowledge and skills related to food (10).

HL appears to be associated with eating behaviors, however, the relationships found between LS and dietary intake have been contradictory. According to the study by *Chari et al.* (2014), it was shown that parents with low literacy are more likely to promote obesogenic food environments. In a study that included hypertensive and diabetic patients, no relationships were found between HL and adherence to the Low Salt Diet or Macronutrient Restricted Diets, respectively. On the other hand, it was found, in another study, that lower quality diets and greater intake of sugary drinks were more prevalent in adults with low HL levels, establishing an association between the variables (2,11–14). In an investigation carried out on patients undergoing kidney transplantation, it was found that higher levels off FL were associated with higher scores on the Mediterranean Diet adherence questionnaire as well as with high scores in the three HL domains (15).

ii. *Mediterranean Dietary Pattern*

The "Mediterranean Diet" (MD) concept became known through the "Seven Countries Study", led by Ancel Keys between 1958 and 1964. In this study, eating habits were compared in different countries, namely in the United States of America (USA) , Japan, Finland, Netherlands, former Yugoslavia, Italy and Greece. In this way, it was possible to characterize this diet in relation to the foods that make up it, despite there not being a single MD, as the foods that make up this pattern vary between countries in the Mediterranean basin (7). Even so, in general, this dietary pattern is characterized by favoring the consumption of foods of plant origin, including a high amount of fruit and vegetables, whole grains, legumes, olive oil, oilseed fruits and a moderate intake of meat, fish and dairy products. Water is the main drink and wine should be consumed in moderation, only with main meals. This dietary pattern uses a healthy culinary base, using dishes cooked in water (soups, boiled, stews), preserving nutrients, and giving priority to fresh and seasonal products. Thus, it is a food model that promotes health and protects the environment and has been considered intangible cultural heritage of humanity since December 2013 (16,17).

In 2020, adherence to the MD was studied in Portugal, and it was found that 26% of the Portuguese population has "High Adherence" to the MD, which means that the percentage of "Low Adherence" is 74%. Therefore, the majority of Portuguese people do not follow this health-protective dietary pattern (17).

iii. *Portuguese Senior Population and Aging Process*

The aging process encompasses not only biological changes, but also social and psychological ones. Through the analysis of statistical data, relating to 2021, mentioned in the PORDATA database, it is possible to verify the increase in the Aging Index over the last few years, which translates into the number of

people aged 65 or over per 100 people under 15 years old. A value below 100 means that there are fewer elderly people than young people. In 2001, this index stood at 102.2, having increased to 182.1 in 2021. The longevity index has also been increasing, going from 39.3 to 47.9, respectively in the years mentioned. Thus, it is possible to witness an inversion of percentages in terms of the size of the senior population (individuals aged 65 or over), adults and young people, making the aging process a central problem in our societies, especially the more developed ones. Several challenges thus arise, encompassing social support structures, mainly in terms of health, pension and social security schemes and longevity, life trajectory and work (4–6).

In this light, Senior Universities have demonstrated an essential role in the acquisition and continuous updating of knowledge, improvement of skills and sharing of reflective and practical knowledge among the senior population (6).

iv. *Senior Universities*

The Senior Universities (SU) existing in Portugal differ from social centers and/or day centers in several aspects, being aimed at populations with different characteristics. In the SU, the population is physically and psychologically autonomous, showing some weakness in knowledge of new technologies, while in the centers, they present more physical and/or intellectual difficulties. However, aspects such as the creation of interpersonal relationships, socialization between peers, combating isolation and cognitive degeneration, are common aspects between both.

Due to the growing number of SU, in 2016, the need arose for official recognition through the creation of the Network of Senior Universities (NSU) as a representative entity for them, also holding the role of partner for the development of active aging policies and the social economy. (6.18).

SU students are mostly women (76%), aged between 60 and 70 years old, retired or domestic workers (80%) and with qualifications ranging from 4th class to PhD. At SU, courses are taught by specialists in different areas and most of the subjects taught are common to all Universities, including Sports, Arts, IT, Health and others (18).

II. Objectives

a) Main Objective

Check whether there is a relationship between the level of Health Literacy and the level of Adherence to the Mediterranean Dietary Pattern in students at Senior Universities.

b) Specific Objectives

Analyze the impact of socioeconomic factors on adherence to the Mediterranean Dietary Pattern and on Health Literacy levels of students at Senior Universities.

III. Material and Methods

a) Study Design

An analytical observational study was developed and, regarding the timeline, it is classified as cross-sectional. This was a level II correlational descriptive study.

b) Study Location

The development of the study was carried out in some Portuguese Senior Universities, namely the Senior University of Curia, the Senior University of Nelas, the Senior University of Gouveia, the Senior University Aposenior Coimbra and the Senior University D. Sancho I, in Almada.

c) Duration and Period of Study

The duration of the study covered the academic year 2021/2022 and regarding the study period (analytical collection), it took place between the months of March and May 2022, inclusive.

d) Target Population

This study encompasses any student enrolled in the selected Senior Universities, with a sample consisting of adults and elderly people. As for the inclusion criteria in the study, these were being registered as a student in one of the selected Senior Universities and presenting duly signed informed consent, with the lack of one of these defined as exclusion criteria.

e) Sample Size and Characterization

Of a total of 2462 students enrolled in the US covered in the study, responses were obtained from 114 students. These students range in age from 54 to 88 years old, with 79 individuals being female and the remaining 35 being male. The majority have Portuguese nationality, with only one individual with Angolan nationality. Regarding the area of residence, only the Center Regions and Metropolitan Area of Lisbon are covered.

f) Sampling type and Technique

The type of sampling applied was non-probabilistic and regarding the sampling technique, this was for convenience..

g) Data Collection Instruments

Study data was collected through questionnaires completed online or in person, depending on the University. The platform chosen to apply the questionnaire in an online format was Google Forms. In the first instance, the individual's willingness to participate in the study of their own free will, without any ethical or moral prejudice, was questioned. Data collection comprised three parts, obtaining sociodemographic data, applying the PREDIMED questionnaire and applying the HLS-EU-PT47 questionnaire.

i. *Sociodemographic Questionnaire*

With the aim of analyzing the sociodemographic data of the sample, a questionnaire was created, based on questionnaires used in other studies related to the theme of health literacy, in which the following parameters were collected: gender; date of birth; educational qualifications; nationality; residence zone; Senior University where he was enrolled (19,20).

ii. *Predimed questionnaire*

The instrument used to assess adherence to the Mediterranean Dietary Pattern was the PREDIMED questionnaire. This is a validated questionnaire for the Portuguese population consisting of 14 questions related to the consumption/frequency of consumption of various foods included and not included in this pattern. For each question, scoring criteria are defined, based on compliance or non-compliance with the MD principles. Thus, for data analysis, responses that meet the criteria are scored with one point and those that do not meet the criteria are not scored. In this way, a final score is obtained that corresponds to the sum of the scores of the 14 questions. This score can vary between 0 and 14 points, with adherence to the Mediterranean Dietary Pattern defined at two levels: low (< 10 points) and high (≥ 10 points) (17).

iii. *Hls-Eu-Pt47 Questionnaire*

The HLS-EU is an instrument to assess the level of Health Literacy by self-perception. This is a questionnaire with which, through a scale of four classifications (from "very difficult" to "very easy"), the participant indicates the degree of difficulty they feel in carrying out tasks relevant to individual health (19).

This instrument consists of 47 questions, grouped into three health domains ("Health Care", "Health Promotion" and "Disease Prevention") and four levels of information processing that influence decision-making (access, understanding, evaluation and use), which allows categorizing health literacy groups according to cutoff points. In order to guarantee the correct calculation of the indices and ensure comparison between them, the four calculated indices were organized on a scale from 0 to 50, in which 0 is the minimum possible Health Literacy and 50 is the maximum. Next, the following cutoff points are identified for the four levels: scores equal to or less than 25 points = Inadequate Health Literacy; scores between 25-33 points = Problematic Health Literacy; scores between 33-42 = Sufficient Health Literacy; and scores between 42-50 = Excellent Health Literacy (19).

It should be noted that only questionnaires with more than 80% of the items answered with specific indices (1 to 4 values) are considered valid (21).

This questionnaire has already been validated for the Portuguese population, with the original 47 questions being maintained, meaning that the HLS-EU-PT is similar in terms of psychometric properties to the original scale. Therefore, it is an instrument that is suitable for analyzing the level of Health Literacy in the Portuguese population.

h) Ethical Issues

All phases of the study respected the required ethical rigor to the maximum. The sources used as theoretical support were duly identified and referenced, respecting the rights of each author.

With regard to data collection, participants were previously informed about the objectives and methodology of the investigation, about the information to be collected and the purposes for which it would be used, as well as the methods of processing the information in order to guarantee the confidentiality and anonymity of data. Thus, participation in this research was part of a conscious decision-making process on the part of each individual, through the signing of informed, free and clarified consent, also having the possibility of refusing to participate without any prejudice, safeguarding the interests and rights of each participant

Finally, formal emails were sent to the management of the Senior Universities requesting collaboration in the research, informed, free and informed consent documents were distributed to all participants and a favorable ethical opinion was also obtained from the Ethics Committee of the Polytechnic Institute of Coimbra (ECPIC).

IV. Statistical Analysis

To perform the statistical analysis, the statistical software IBM SPSS Statistics version 27.0 was used.

In an initial phase, the HLS-EU-PT47 scores were calculated, through data processing and calculation of scores using the formula, in order to proceed with the classification (22).

For descriptive statistics, measures of central tendency (mean and median) and measures of dispersion (standard deviation, minimum and maximum) were determined in relation to age, responses to the PREDIMED questionnaire and other sociodemographic variables.

Subsequently, at the level of hypotheses, the Chi-Square test, Student's t-test and the Kruskal-Wallis test were applied. For statistical inference, a confidence level of 95% was assumed for a maximum random error of up to 5%.

V. Results

The final sample was made up of 114 students, who completed all the questionnaires. However, it should be noted that, regarding the HLS-EU-PT47 questionnaire, eight of them were excluded because they did not meet the criteria for validation of this questionnaire (more than 80% of the questions answered with an exact answer).

In table 1 it is possible to characterize the sample in relation to Literary Qualifications. Thus, it was found that 22.8% of the participants had Basic Education (n=26), 23.7% had Secondary Education (n=27), and 42.9% of the participants had completed some degree of Higher Education (n =49). The most prevalent level of Literary Qualification in females was Bachelor's Degree, with 43%, and in males, Secondary Education was prevalent in 34.3% of participants.

Table 1: Characterization of the Sample Regarding Literary Qualifications

Literary Qualifications		Gender		Total
		Female	Male	
Basic Education	n (%)	18 (69.2%)	8 (30.8%)	26
	% column	22.8%	22.9%	22.8%
Secondary Education	n (%)	15 (55.6%)	12 (44.4%)	27
	% column	19%	34.3%	23.7%
Non-Higher Professional Qualification	n (%)	5 (41.7%)	7 (58.3%)	12
	% column	6.3%	20%	10.5%
Bachelor`s Degree	n (%)	34 (85%)	6 (15%)	40
	% column	43%	17.1%	35%
Postgraduate	n (%)	3 (75%)	1 (25%)	4
	% column	3.8%	2.9%	3.5%
Master's degree	n (%)	4 (80%)	1 (20%)	5
	% column	5.1%	2.9%	4.4%
Total	n (%)	79 (69.3%)	35 (30.7%)	114
	% column	100%	100%	100%

With regard to the Residence Area, it can be seen in table 2 that the sample was characterized by containing 25.4% of participants residing in the Lisbon Metropolitan Area (LMA) (n=29), 58.6% female (n=17). The remaining 74.6% of participants lived in the Central area, with 72.9% being women (n=62).

Table 2: Characterization of the Sample According to Area of Residence and Age

Residence Zone		Gender		Total
		Female	Male	
Lisbon Metropolitan Area	n (%)	17 (58.6%)	12 (41.4%)	29
	% column	21.5%	34.3%	25.4%
Center	n (%)	62 (72.9%)	23 (27.1%)	85
	% column	78.5%	65.7%	74.6%
Total	n (%)	79 (69.3%)	35 (30.7%)	114
	% column	100%	100%	100%
Age	M ± SD	68.81 ± 6.35	71.4 ± 6.61	69.62 ± 6.51

Legend: M = Mean; SD = Standard Deviation

The average age of the participants was 69.62 years, with the average age of females being slightly lower than that of males, 68.81 years and 71.40 years, respectively (table 2).

In table 3, it is observed that there were no significant differences in the HLS classification depending on age (p>0.05). Even so, it was found that the highest average age, 70.73 years, was more associated with the “Problematic” classification level.

Table 3: Differences in Classification in *HLS-EU-PT Depending on Age*

	HLS classification				Total	*p*
	Inappropriate	Problematic	Enough	Excellent		
n	12	62	25	5	104	0.226
M ± DV	67.17 ± 6.013	70.73 ± 5.848	69.16 ± 8.697	68.00±4,899	69.81 ± 6.652	

Legend: M = Average; SD =Standard Deviation; TestKruskal-Wallis (Significant correlation when p≤ 0.05)

There were no significant differences in the classification obtained in the HLS-EU-PT questionnaire depending on gender ($p>0.05$). Even so, it was possible to verify that the most common classification in both genders was "Problematic". It is also concluded that the "excellent" classification was the least prevalent in both genders (table 4).

Table 4: Differences in Classification in *HLS-EU-PT as a Function of Gender*

			Gender		Total	*p*
			Female	Male		
HLS Classification	Inappropriate	n (%)	11 (84.6%)	2 (15.4%)	13	0.511
		% column	14.9%	6.3%	12.3%	
	Problematic	n (%)	41 (66.1%)	21 (33.9%)	62	
		% column	55.4%	65.6%	58.5%	
	Enough	n (%)	17 (68.0%)	8 (32.0%)	25	
		% column	23.0%	25.0%	23.6%	
	Excellent	n (%)	5 (83.3%)	1 (16.7%)	6	
		% column	6.8%	3.1%	5.7%	
Total		n (%)	74 (69.8%)	32 (30.2%)	106	
		% column	100.0%	100.0%	100.0%	

Caption: Test Chi-Square of Independence (Significant correlation when $p \leq 0.05$)

As can be seen in table 5, the classifications of "Inadequate", "Problematic" and "Sufficient" regarding the level of health literacy were higher in the central zone than in the LMA. This condition only did not occur in the "excellent" classification, in which identical percentages were obtained for both areas. The results were not significant ($p>0.05$).

Table 5: Differences in Classification in *HLS-EU-PT Depending on the Area of Rresidence*

			Residence Zone		Total	*p*
			LMA	Center		
HLS Classification	Inappropriate	n (%)	2 (15.4%)	11 (84.6%)	13	0.462
		% column	7.1%	14.1%	12.3%	
	Problematic	n (%)	16 (25.8%)	46 (74.2%)	62	
		% column	57.1%	59.0%	58.5%	
	Enough	n (%)	7 (28.0%)	18 (72.0%)	25	
		% column	25.0%	23.1%	23.6%	
	Excellent	n (%)	3 (50.0%)	3 (50.0%)	6	
		% column	10.7%	3.8%	5.7%	
Total		n (%)	28 (26.4%)	78 (73.6%)	106	
		% column	100.0%	100.0%	100.0%	

Caption: Test Chi-Square of Independence (Significant Correlation when $p \leq 0.05$); AML - Lisbon Metropolitan Area

Next, the relationship between Literary Qualifications and the classification of the HLS questionnaire was evaluated (Table 6). It was found that there were no significant differences between the two ($p>0.05$). Even so, it was possible to verify that the majority of participants have a "problematic" level of HL. In all educational qualifications, the classification with the lowest prevalence was the "excellent" level, except in Higher Education, in which the "inadequate" level had the lowest prevalence.

It should be noted that at all levels of educational qualifications, the majority of literacy levels were classified as "Problematic".

Table 6: Differences in Classification in *HLS-EU-PT According to Academic Qualifications*

			HLS classification				Total	*p*
			Inappropriate	Problematic	Enough	Excellent		
Literary Qualifications	Basic Education	n (%)	4 (16.7%)	12 (50.0%)	8 (33.3%)	0	24	0.559
		% column	30.8%	19.4%	32.0%	0.0%	22.6%	
	Secondary Education	n (%)	4 (16.7%)	15 (62.5%)	4 (16.7%)	1 (4.2%)	24	
		% column	30.8%	24.2%	16.0%	16.7%	22.6%	
	Qualification NHP	n (%)	1 (8.3%)	8 (66.7%)	3 (25.0%)	0	12	
		% column	7.7%	12.9%	12.0%	0.0%	11.3%	
	Higher education	n (%)	4 (8.7%)	27 (58.7%)	10 (21.7%)	5 (10.9%)	46	
		% column	30.8%	43.5%	40.0%	83.3%	43.4%	
Total		n (%)	13 (12.3%)	62 (58.5%)	25 (23.6%)	6 (5.7%)	106	
		% column	100.0%	100.0%	100.0%	100.0%	100.0%	

Caption: Test Chi-Square of Independence; (Significant Correlation when p≤ 0.05); NHP – Non-Higher Professional

Analyzing the relationship between age and the classification obtained in PREDIMED (Table 7) it is clear that there were no significant differences (p>0.05). The average age of participants with "high adherence to MD" was slightly lower than that of those who revealed "low adherence", with respective values of around 68 and 70 years.

Table 7: Differences in Classification in *PREDIMED Depending on Age*

	PREDIMED Classification	N	M ± DV	*p*
Age	Low adherence	70	70.39± 6.636	0.107
	High adhesion	42	68.33± 6.167	

Legend: M = Average; SD =Standard Deviation; t-Student test (Significant Correlation when p≤ 0.05)

There were no significant differences in the classification obtained in PREDIMED depending on gender, however, it was observed that in both genders there was a higher percentage of "low adherence", this being higher in men than in women, with 71.4 % and 58.2%, respectively (Table 8).

Table 8: Differences in Classification in *PREDIMED as a Function of Gender*

			PREDIMED Classification		Total	*p*
			Low Adherence	High Adhesion		
Gender	Female	n (%)	46 (58.2%)	33 (41.8%)	79	0.180
		% column	64.8%	76.7%	69.3%	
	Male	n (%)	25 (71.4%)	10 (28.6%)	35	
		% column	35.2%	23.3%	30.7%	
Total		n (%)	71 (62.3%)	43 (37.7%)	114	
		% column	100.0%	100.0%	100.0%	

Caption: Test Chi-Square of Independence; (Significant correlation when p≤ 0.05)

Now evaluating the relationship between the classification obtained in PREDIMED and the area of residence (Table 9), it was concluded that there were no significant differences (p>0.05). It can be seen, however, that the prevalence of low adherence was higher in the center compared to the metropolitan area of Lisbon, with values of 78.9% and 21.1%, respectively. It is also noticeable that in the Lisbon metropolitan area there was a slightly disparate distribution of "high" and "low" adherence, with the percentage of low adherence being slightly higher. In the Center area, the percentage of low adherence was considerably higher than that of high adherence, with 65.9% and 34.1%, respectively.

Table 9: Differences in Classification in PREDIMED Depending on the Area of Residence

			PREDIMED Classification		Total	*p*
			Low adherence	High adhesion		
Residence zone	Lisbon Metropolitan Area	n (%)	15 (51.7%)	14 (48.3%)	29	0.174
		% column	21.1%	32.6%	25.4%	
	Center	n (%)	56 (65.9%)	29 (34.1%)	85	
		% column	78.9%	67.4%	74.6%	
Total		n (%)	71 (62.3%)	43 (37.7%)	114	
		% column	100%	100.0%	100.0%	

Caption: Test Chi-Square of Independence; (Significant Correlation when p≤ 0.05)

Next, the level of Literary Qualifications was compared with the Classification obtained in PREDIMED (Table 10). The results obtained were not significant (p>0.05). Even so, it was possible to verify that, in all levels of Literary Qualifications, the majority of participants presented "low adherence" to the Mediterranean Dietary Pattern. It should be noted that the highest percentage of "low adherence" was found in "Basic Education" (76.9%) and the lowest in "Higher Education" (55.1%).

Table 10: Differences in Classification in *PREDIMED Depending on Literary Qualifications*

			PREDIMED Classification		Total	*p*
			Low adherence	High adhesion		
Literary Qualifications	Basic Education	n (%)	20 (76.9%)	6 (23.1%)	26	0.302
		% column	28.2%	14.0%	22.8%	
	Secondary Education	n (%)	16 (59.3%)	11 (40.7%)	27	
		% column	22.5%	25.6%	23.7%	
	Non-higher professional qualification	n (%)	8 (66.7%)	4 (33.3%)	12	
		% column	11.3%	9.3%	10.5%	
	Higher education	n (%)	27 (55.1%)	22 (44.9%)	49	
		% column	38.0%	51.2%	43.0%	
Total		n (%)	71 (62.3%)	43 (37.7%)	114	
		% column	100%	100.0%	100.0%	

Caption: Test Chi-Square of Independence; (Significant Correlation when p≤ 0.05)

With the data presented in table 11, it was possible to verify that although the entire sample uses olive oil as the main source of fat for cooking, the majority (77.4%) consumes less than 4 tablespoons per day.

It was also found that 71.7% of respondents consumed more than two portions of vegetables per day. Regarding the consumption of fruit and legumes, most of the sample (59.4% and 50.9%, respectively) revealed that they consumed more than 3 portions of these foods per day.

It was also noticeable that the majority of the sample consumed fish or seafood more than 3 times a week and that more than 70% preferred white meat to red meat, with 67% saying they consumed less than one portion of red meat, hamburger or derivatives, per day.

With regard to cooking methods, it was found that 66% of participants consumed meals cooked with a base of tomato, onion, garlic and olive oil more than twice a week.

Regarding the consumption of more sugary foods, the majority of respondents responded that they drank soft drinks less than once a day (87.7%) and consumed sweet desserts, cookies and cakes less than 3 times a week (68.9%).

In the case of portions of oilseed fruits per week, 50.9% said they consumed less than 3 portions.

Table 11: Relationship between the Answers Obtained in the *PREDIMED and Classification in HLS-EU-PT47*

			HLS classification				
			Inappropriate	Problematic	Enough	Excellent	Total (% column)
How many tablespoons of olive oil do you consume per day?	<4	n (%)	11 (13.4%)	47 (57.3%)	19 (23.2%)	5 (6.1%)	82 (77.4%)
	>=4	n (%)	2 (8.3%)	15 (62.5%)	6 (25.0%)	1 (4.2%)	24 (22.5%)
How many servings of vegetables do I consume per day?	>=2	n (%)	7 (9.2%)	46 (60.5%)	19 (25.0%)	4 (5.3%)	76 (71.7%)
	>=2	n (%)	7 (9.2%)	46 (60.5%)	19 (25.0%)	4 (5.3%)	76 (71.7%)
How many servings of fruit do you consume per day?	<3	n (%)	4 (9.3%)	21 (48.8%)	15 (34.9%)	3 (7.0%)	43 (40.6%)
	>=3	n (%)	9 (14.3%)	41 (65.1%)	10 (15.9%)	3 (4.8%)	63 (59.4%)
How many servings of red meat, hamburgers or derivatives do you consume per day?	>=1	n (%)	4 (11.4%)	25 (71.4%)	6 (17.1%)	0	35 (33.0%)
	<1	n (%)	9 (12.7%)	37 (52.1%)	19 (26.8%)	6 (8.5%)	71 (67.0%)
How many sugary soft drinks do you consume per day?	>=1	n (%)	1 (7.7%)	9 (69.2%)	3 (23.1%)	0	13 (12.3%)
	<1	n (%)	12 (12.9%)	53 (57.0%)	22 (23.7%)	6 (6.5%)	93 (87.7%)
How many servings of legumes do you consume per week?	<3	n (%)	9 (17.3%)	27 (51.9%)	14 (26.9%)	2 (3.8%)	52 (49.1%)
	>=3	n (%)	4 (7.4%)	35 (64.8%)	11 (20.4%)	4 (7.4%)	54 (50.9%)
How many servings of fish or seafood do you consume per week?	<3	n (%)	5 (13.9%)	21 (58.3%)	8 (22.2%)	2 (5.6%)	36 (34.0%)
	>=3	n (%)	8 (11.4%)	41 (58.6%)	17 (24.3%)	4 (5.7%)	70 (66.0%)
How many times a week do you eat sweet desserts, cookies and cakes?	>=3	n (%)	2 (6.1%)	21 (63.6%)	10 (30.3%)	0	33 (31.1%)
	<3	n (%)	11 (15.1%)	41 (56.2%)	15 (20.5%)	6 (8.2%)	73 (68.9%)
How many servings of oilseed fruits (walnuts, hazelnuts, almonds, peanuts, etc.) do you consume per week?	<3	n (%)	7 (13.0%)	31 (57.4%)	15 (27.8%)	1 (1.9%)	54 (50.9%)
	>=3	n (%)	6 (11.5%)	31 (59.6%)	10 (19.2%)	5 (9.6%)	52 (49.1%)
Do you prefer to consume turkey, chicken, rabbit, or a vegetable alternative, rather than pork or beef?	No	n (%)	2 (9.1%)	14 (63.6%)	5 (22.7%)	1 (4.5%)	22 (20.8%)
	Yes	n (%)	11 (13.1%)	48 (57.1%)	20 (23.8%)	5 (6.0%)	84 (79.2%)
How many times a week do you eat meals cooked with tomatoes/tomato sauce, onion, garlic and olive oil?	<2	n (%)	2 (5.6%)	21 (58.3%)	11 (30.6%)	2 (5.6%)	36 (34.0%)
	>=2	n (%)	11 (15.7%)	41 (58.6%)	14 (20.0%)	4 (5.7%)	70 (66.0%)

Next, we attempted to relate the classification obtained in the HLS questionnaire with the classification in the PREDIMED questionnaire (Table 12). Thus, it was concluded that the majority of respondents have a "problematic" level of health literacy (58.5%) and revealed "low adherence" to MD (66%).

It was found that participants with "inadequate", "problematic" and "sufficient" health literacy levels were mainly associated with "low adherence" to the Mediterranean dietary pattern, with the percentages of low adherence being 69.2%, 66, 1% and 68%, respectively.

It was also understood that participants with the lowest level of health literacy had the lowest percentage of "high adherence" to MD. Only among participants with an "excellent" level of health literacy was there a considerable increase in the percentage of "high

adherence" to the Mediterranean Dietary Pattern, with a result of 50% being obtained. Even so, the results were not significant with regard to the PREDIMED classification depending on the HLS-EU-PT classification ($p>0.05$).

Table 12: Differences in the Classification in the PREDIMED Questionnaire Depending on the Classification in the HLS-EU-PT Questionnaire

			PREDIMED Classification		Total	*p*
			Low adherence	High adhesion		
HLS classification	Inappropriate	n (%)	9 (69.2%)	4 (30.8%)	13	0.852
		% column	12.9%	11.1%	12.3%	
	Problematic	n (%)	41 (66.1%)	21 (33.9%)	62	
		% column	58.6%	58.3%	58.5%	
	Enough	n (%)	17 (68.0%)	8 (32.0%)	25	
		% column	24.3%	22.2%	23.6%	
	Excellent	n (%)	3 (50.0%)	3 (50.0%)	6	
		% column	4.3%	8.3%	5.7%	
Total		n (%)	70 (66.0%)	36 (34.0%)	106	
		% column	100%	100.0%	100%	

Test Chi-Square of Independence; (Significant Correlation when p≤ 0.05)

The question coded as HLSQ38 corresponded to the question "Understanding the information on food packaging?". Even though the differences are not significant ($p>0.05$), the results presented in table 10 show that the majority of respondents who classified the HLSQ38 as "very difficult", "difficult" or "easy" had low adherence to MD, with 75%, 73.2% and 58.5%, respectively. The percentages of low and high adherence were only equal when they were associated with a "very easy" rating on question 38.

Table 13: Differences in the Classification of Question 38 of the HLS-EU-PT Depending on the PREDIMED Classification

			PREDIMED Classification		Total	p
			Low adherence	High adhesion		
HLSQ38	Very difficult	n (%)	3 (75.0%)	1 (25.0%)	4	0.333
		% column	4.3%	2.5%	3.6%	
	Difficult	n (%)	30 (73.2%)	11 (26.8%)	41	
		% column	42.9%	27.5%	37.3%	
	Easy	n (%)	31 (58.5%)	22 (41.5%)	53	
		% column	44.3%	55.0%	48.2%	
	Very easy	n (%)	6 (50.0%)	6 (50.0%)	12	
		% column	8.6%	15.0%	10.9%	
Total		n (%)	70 (63.6%)	40 (36.4%)	110	
		% column	100.0%	100.0%	100.0%	

Test Chi-Square of Independence; (Significant Correlation when p≤ 0.05)

VI. Discussion and Critical Analysis

Between 2020 and 2021, the General Health Direction (GHD) carried out an assessment of the Health Literacy of the Portuguese population, those over 16 years of age, and the "Health Literacy Survey" document referring to the data obtained was published. In this GHD assessment, it was found that there was a greater proportion of Portuguese with high levels of literacy, corresponding to the "Sufficient" or "Excellent" level, than with low levels, that is, "Problematic" or "Inadequate" level, having the majority (65%) obtained a "Sufficient" rating.

In contrast, in the sample of the present study, it was found that the majority (58.5%) had a "Problematic" level of HL, considered low. It should also be noted that in the aforementioned document only 7.5% presented the lowest level of health literacy ("Inadequate"), while in this study this level was presented by 12.3%. This divergence in results may be justified by the fact that the present study included mostly elderly people, one of the most vulnerable age groups with regard to HL knowledge and with a greater probability of obtaining a classification of "Inadequate" or "Problematic" in the HL level, as demonstrated in two studies by *Espanha et al.*(8.23). Even so, the percentage of low levels of health literacy obtained in the present study was 70.8%, lower than that obtained by *Araújo, et al.* in the study carried out in 2018, 80%(24).

Also in the "Health Literacy Survey", HL levels were analyzed considering sociodemographic data, namely Gender, Age and Education. No association was found with Gender, however, it was found that LS levels were associated with Age and Education, with an increase in low LS levels being revealed as the age group increased and education decreased.(1). Also *Spain et al.* , *Araújo et al. and Luís L.* demonstrated that higher levels of education and younger age groups were associated with higher levels of LS(8.23–25). On the contrary, in the present study, no significant associations were found between the LS variable and the factors Gender, Age and Educational Qualifications. Even so, in relation to Literary Qualifications, it was observed that the least predominant classification was "Excellent" at all levels of education except for those with Higher Education, whose lowest prevalence of classification was the "Inadequate" level, which seems to be in line with according to the results of the aforementioned study.

Regarding the analysis of Adherence to MD, in the present study, the majority of participants reveal that they have a "Low Adherence" to MD, this percentage being 62.3%, which is in line with the results of *Spinelli*'s study, carried out on the population elderly woman from the Algarve region, in which a percentage of "Low Adherence" to MD was also demonstrated (71%) higher than that of "High Adherence"(20). The same can be seen when comparing with the "Mediterranean Food Pattern Adherence Study", carried out by the GHD for the Portuguese population over 16 years old, in 2020, in which the "Low Adherence" rate is stood at 74% (17). According to the study by *Zaragoza Martí et al.,* carried out in a senior population in Spain in 2015, the percentage of "Low Adherence" to MD was 51.7%, demonstrating better adherence compared to current values, which may mean temporal evolution or cultural variation (26).

The GHD study also concluded that age appears to influence adherence to the Mediterranean Dietary Pattern (MDP), with the elderly age group having the lowest percentage of adherence, at just 19%, compared to 33% in the 16 to 34 age group. In this study, the percentage of individuals adhering to the MDP was higher, around 37.7%, which may be related to the fact that the sample included in this study was inserted in a very specific context (17).

Regarding the relationship between Adherence to MD and Gender, in the study by *Zaragoza Martí et al.,* no significant differences were identified between different genders, similar to the present study.(26). In Spinelli's study, the percentage of "Low Adherence" was focused on the Female gender, contrasting with the data from the "Study of Adherence to the Mediterranean Diet", in which men presented the lowest percentage of "High Adherence" (17.20).

According to *Gregório et al.,* it was concluded that individuals with higher education had better levels of adherence to MD, since the percentage of "High Adherence" was 11% higher in individuals with "more than the 12th grade"(17). Also in *Spinelli*'s study, lower adherence was found among respondents with lower levels of education.(20). In the present study, there are no significant differences, although it was found that the highest prevalence of "low adherence" occurred at the lowest level of education (basic education), contrasting with the highest percentage of "high adherence", obtained at the highest level. of Qualifications (Higher Education), which seems to be in line with what is described in the literature.

Similar to what was found in the study carried out in the Algarve, despite the fact that a large proportion of respondents showed low adherence to MD, the responses obtained in PREDIMED were relatively satisfactory (20). The entire sample in the present study reported using olive oil as their main fat, in line with the literature that reports percentages in the order of 90%, and the majority complies with the recommendations regarding the consumption of vegetables, fruit and legumes (20.26). Despite the primacy of olive oil for culinary uses, the majority of respondents responded that they consume less than 4 tablespoons per day, which may be indicative of difficulties in controlling food portions. Additionally, the majority of the population does not measure the exact amount of fat they use, and it is likely that their perception of the amounts used is not correct.

When comparing the results obtained with the recommendations for fruit and vegetable intake, it is possible to state that the percentage of adequacy was higher in this study compared to the GHD study. While, in the general population, a percentage of 39% of adequate fruit consumption was found, in the population of Senior Universities, the value rises to 59.4%. The same occurred in the case of vegetables, with an even greater discrepancy in values (17). These results may be a reflection of the fact that most of the participants in this study live in rural areas and have their own crops.

Regarding the adequate consumption of fish and seafood, it was found to be complied with by 66% of the sample in this study, slightly below the 74% obtained in the study carried out in the elderly population of the Algarve (20). These results may be inherent to the difference in accessibility of these foods in coastal and inland areas. Spinelli also demonstrated, in 93% of respondents, a preference for white meat over red meat, a value higher than that obtained in the present study (70%) (20).

In relation to sugary foods, there was a preference for the consumption of sweet desserts, cookies and cakes compared to the consumption of soft drinks, which may be related to the fact that soft drinks gained a greater impact on the market after the

existence of other products. It was also found that of the individuals with an "excellent" HL level, none reported an inadequate consumption of soft drinks and desserts, sweets, cookies and cakes. These data seem to be in line with those found in the systematic review by *Alessandra Buja et al.* , in which it was found that three studies associated higher HL levels with lower sugar consumption (27).

Regarding understanding the information contained on food packaging, despite there being no direct relationship with adherence to the MD, it was observed that individuals with high adherence classify this task less often as "very difficult" or "difficult". Even so, 40.9% of the sample revealed difficulties, a figure that could be higher in reality, as it was not determined whether the interpretation of each piece of information would be correct.

Still regarding the relationship between adherence to the MDP and the level of HL, it should be noted that, despite being independent of the "HLS classification" factor, there was a trend in the results, since the highest percentage of "low adherence" was associated with the lowest level of literacy. These results seem to indicate that, by increasing the levels of HL, the levels of adherence to the MDP would also increase, thus deducing the relevance of training interventions in this area, since it has already been demonstrated by *Kazuki Uemura et al.* that constant learning in the senior population promotes the improvement of HL and eating habits.(28).

VII. Study Limitations

With the development of the investigation, several limitations emerged that influenced the collection of data as well as the results, and must be taken into consideration when interpreting the data presented. One of the limitations was the sample size, as there was low student adherence, which resulted in a reduced number of participants compared to expected, not being enough to obtain conclusions similar to those obtained if the entire target population participated. Therefore, it is not possible to extrapolate this data to the generality, as this data constitutes only a characterization of the reality of the participating students.

Another limitation is the ability to understand and correctly interpret the questionnaires applied, which may have been distorted in some cases, especially in the online version of the questionnaires. In future studies, we propose the evaluation of other variables that could influence adherence to the Mediterranean dietary pattern, such as family income, household size, marital status, among others.

VIII. Conclusion

It can be concluded that the results obtained in this study were not statistically significant, which can be explained, in general, by the fact that both the level of Health Literacy and Adherence to the MDP constitute variables influenced by several factors, which can be complex interconnect them in a "cause-effect" relationship. Even so, it was possible to verify that the sample, in general, had lower than desirable levels of Health Literacy, as well as low adherence to the MDP. These results may constitute a vulnerability for the health status of the individuals surveyed, since low HL translates into insufficient knowledge and skills to prevent disease and improve health status, thus influencing food choices.

There is a clear need for more health education programs, designed to respond to the specificities of each population and age group, in order to fill the gaps previously described. As eating habits are decisive for a good state of health, the Nutritionist plays an important role in promoting their improvement and adequacy. This type of interventions plays a beneficial role at the individual level, but also in a comprehensive way, for the general population, since populations with higher levels of HL are associated with better health states and, consequently, less impact on this resources. sector in question.

The measurement of the levels of the variables mentioned above must be carried out regularly, as they undergo constant changes and, in this sense, this study could contribute to the knowledge of the "state of play" in this population, functioning as a starting point for possible training interventions on topics specific, adapted to the needs of the population studied.

It is also concluded that it would be beneficial to carry out more studies in this area, with greater methodological robustness, particularly at national level, with a larger and more heterogeneous sample, with the aim of keeping this topic in the focus of political decision-makers as a priority action.

List of Abbreviations

ECPIC - Ethics Committee of the Polytechnic Institute of Coimbra;

GHD - General Health Direction;

MD - Mediterranean Diet

MDP - Mediterranean Dietary Pattern;

HLS-EU-PT47 - Health Literacy Scale-European-Portugal 47 questions;

M-POHL - Measuring Population and Organizational Health Literacy;

FL - Food Literacy;

HL - Health Literacy;

NSU - Network of Senior Universities;

UNESCO - United Nations Educational, Scientific and Cultural Organization;

SU - Senior Universities;

WHO - World Health Organization.

Bibliography

1. Arriaga MT de, Santos B dos, Costa AS da, Francisco R, Nogueira P, Oliveira J, et al. Health Literacy Survey [Internet]. Direção Geral da Saúde, editor. Lisboa; 2021. Disponível em: https://www.dgs.pt/documentos-e-publicacoes/estudo-apresenta-nivel-de-literacia-em-saude-dos-portugue-ses-pdf.aspx
2. Taylor MK, Sullivan DK, Ellerbeck EF, Gajewski BJ, Gibbs HD. Nutrition literacy predicts adherence to healthy/unhealthy diet patterns in adults with a nutrition-related chronic condition. Public Health Nutr. 2019; 22(12):2157–69.
3. Medina DE. Literacia em Saúde: um estudo sobre a população idosa portuguesa. 2019.
4. Fundação Francisco Manuel dos Santos. Indicadores de envelhecimento segundo os Censos - Pordata. 2021. p. 1–3.
5. Fundação Francisco Manuel dos Santos. População residente: total e por grandes grupos etários (%) [Internet]. 2021 [citado 19 de Junho de 2022]. p. 1–4. Disponível em: https://www. pordata.pt/Portugal/Indicadores+de+envelhecimento-526
6. Páscoa GMG, Gil HMPT. As universidades seniores e o envelhecimento ativo: os impactos junto das pessoas idosas em Portugal. Revista Kairós : Gerontologia. 2019; 22(1):41–58.
7. Urquiaga I, Echeverría G, Dussaillant C, Rigotti A. Origen, componentes y posibles mecanismos de acción de la dieta mediterránea. Revista Médica de Chile. 2017; 145: 85–95.
8. Espanha R, Ávila P, Mendes RV. Literacia em saúde em Portugal- Relatório Síntese [Internet]. Fundação C. Fundação Calouste Gulbenkian. Lisboa; 2016. 1–16 p. Disponível em: http://www.gulbenkian.pt
9. Rabaça R. A Literacia em Nutrição na População Portuguesa. Universidade Atlântica; 2015.
10. Real H, Torres R. Literacia Nutricional e Literacia Alimentar: Uma Revisão narrativa sobre Definição, Domínios e Ferramentas de Avaliação. Acta Port Nutr. 2021; 24: 56–63.
11. Bowen ME, Cavanaugh KL, Wolff K, Davis D, Gregory B, Rothman RL. Numeracy and Dietary Intake in Patients with Type 2 Diabetes. Diabetes Educ. 2013; 39(2): 240–7.
12. Zoellner J, You W, Connell C, Smith-Ray RL, Allen K, Tucker KL, et al. Health Literacy is associated with Healthy Eating Index Scores and Sugar-Sweetened Beverage Intake: Findings from the Rural Lower Mississippi Delta Jamie. J Am Diet Assoc. 2011; 111(7):1012–20.
13. Chari R, Warsh J, Ketterer T, Hossain J, Sharif I. Association between health literacy and child and adolescent obesity. Patient Educ Couns. 2014; 94:61–6.
14. Hutchison JA, Warren-Findlow J, Dulin M. The Association between Health Literacy and Diet Adherence among Primary Care Patients with Hypertension Care Patients with Hypertension. 2014; 7(2):109–26.
15. Boslooper-Meulenbelt K, Boonstra MD, van Vliet IMY, Gomes-Neto AW, Osté MCJ, Poelman MP, et al. Food Literacy Is Associated With Adherence to a Mediterranean-Style Diet in Kidney Transplant Recipients. J Ren Nutr. 2021; 31(6): 628–36.
16. Gregório MJ, Rodrigues AM, Graça P, de Sousa RD, Dias SS, Branco JC, et al. Food Insecurity Is Associated with Low Adherence to the Mediterranean Diet and Adverse Health Conditions in Portuguese Adults. Front Public Heal. 2018; 6(February):1–9.
17. Gregório M, Sousa SM de, Chkoniya V, Graça P. Estudo de Adesão ao Padrão Alimentar Mediterrânico. Direção Geral da Saúde. Lisboa; 2020.
18. Diretores LMJJ. Universidades Seniores Portuguesas: Caracterização e Desenvolvimento. Universidad de Salamanca; 2020.
19. Pedro AR, Amaral O, Escoval A. Literacia em saúde, dos dados à ação: tradução, validação e aplicação do European Health Literacy Survey em Portugal. Rev Port Saúde Pública [Internet]. Setembro de 2016; 34(3):259–75. Disponível em: https://linkinghub.elsevier.com/retrieve/pii/S0870902516300311
20. Spinelli A da S. Caracterização Da Adesão a Dieta Mediterrânica E Conhecimentos Nutricionais Dos Idosos Do Algarve. Univ do Algarve. 2020.
21. Consortium HLS-EU. Comparative Report on Health Literacy in Eight EU Member States. The European Health Literacy Survey HLS-EU (Second Revised and Extended Version, Date July 22nd, 2014), Online Publication: http://www.health-literacy.eu. Maastricht University. 2012
22. Pelikan JM, Rothlin F, Ganahl K. HLS-EU Consortium (2012): Comparative Report on Health Literacy in Eight EU Member States [Internet]. The European Health Literacy Consortium. The Nethrlands; 2012. Disponível em: http://www.health-literacy.eu
23. Espanha R, Ávila P. Health Literacy Survey Portugal: A Contribution for the Knowledge on Health and Communications. Procedia Comput Sci [Internet]. 2016; 100:1033–41. Disponível em: http://dx.doi.org/10.1016/j.procs.2016.09.277
24. Araújo I, Jesus R, Teixeira M, Cunha A, Santos F, Miranda S. Health literacy of patients with hypertension and diabetes in a northern region of Portugal. Rev Enferm Ref. 2018; IV Série (18):73–82.

25. Luís L. Literacia em Saúde e Alimentação Saudável: Os novos produtos e a escolha dos alimentos. 2010.
26. Martí AZ, Martínez MJC, Sánchez JAH, Pérez AL, Cascales RF. Adherencia a la dieta mediterránea y su relación con el estado nutricional en personas mayores. Nutr Hosp. 2015; 31(4):1667–74.
27. Buja A, Grotto G, Montecchio L, De Battisti E, Sperotto M, Bertoncello C, et al. Association between health literacy and dietary intake of sugar, fat and salt: A systematic review. Public Health Nutr. 2021; 24(8): 2085–97.
28. Uemura K, Yamada M, Okamoto H. Effects of Active Learning on Health Literacy and Behavior in Older Adults: A Randomized Controlled Trial. J Am Geriatr Soc. 2018; 66:1721–9.

Global Journal of Medical Research: L
Nutrition & Food Science
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

About the Fundamental Standards of Nutrition, Food Security and Food Sovereignty

By Mamuka Matsaberidze
Georgian Technical University

Abstract- Today, an estimated one billion people are hungry and undernourished, with detrimental effects on the growth and learning abilities of children and on the ability of adults to lead fully productive lives. Most of these people are in parts of the world where the food available to them is often contaminated or adulterated, increasing the risk of foodborne illness and pandemic gastrointestinal illnesses. Today's reality highlights the existential need for developing countries to improve food safety and quality measures and the challenges associated with meeting these needs. This review article addresses the need to improve food quality and safety systems in developing countries in the context of food security, public health and international trade, and provides evidence and tools to address these challenges using new approaches to capacity building and providing technical assistance on food and nutrition technologies.

Keywords: "malnutrition", "starvation", kwashiorkor, convention on the elimination of all forms of discrimination against women, the right to food guidelines, berlin declaration on open access to knowledge in the sciences and humanities, UFWH, GODAN, PUSH, ferruccio ritossa, stress proteins, pyroptosis, GS1, HACCP.

GJMR-L Classification: LCC Code: TX359, TX531,WB 400, WA 695

Strictly as per the compliance and regulations of:

About the Fundamental Standards of Nutrition, Food Security and Food Sovereignty

Mamuka Matsaberidze

Abstract- Today, an estimated one billion people are hungry and undernourished, with detrimental effects on the growth and learning abilities of children and on the ability of adults to lead fully productive lives. Most of these people are in parts of the world where the food available to them is often contaminated or adulterated, increasing the risk of foodborne illness and pandemic gastrointestinal illnesses. Today's reality highlights the existential need for developing countries to improve food safety and quality measures and the challenges associated with meeting these needs. This review article addresses the need to improve food quality and safety systems in developing countries in the context of food security, public health and international trade, and provides evidence and tools to address these challenges using new approaches to capacity building and providing technical assistance on food and nutrition technologies.

Keywords: "malnutrition", "starvation", kwashiorkor, convention on the elimination of all forms of discrimination against women, the right to food guidelines, berlin declaration on open access to knowledge in the sciences and humanities, UFWH, GODAN, PUSH, ferruccio ritossa, stress proteins, pyroptosis, GS1, HACCP.

I. To Meet the Needs of Developing Countries, it is Necessary to Combine the Cognitive Resources of the Academic Environment

To define hunger among the population in the works of FAO, there is a division into the concepts of "hunger" and "malnutrition". The first is a chronic lack of calories in food, the second is the lack of any important nutritional elements - proteins and vitamins.

The term "malnutrition" (or, should be understood as the insufficiency of both general caloric and specific protein. This is due not to the severity of the consequences of both types of malnutrition for the human body (since the consequences of a lack of vitamins can be no less dangerous to health), but the causes and extent of their spread.

The quantitative criterion in the latter case turns into a qualitative one - the lack of both calories and proteins is a social problem, the solution of which requires significant changes in the entire socioeconomic structure of the region where the population suffers from calorie or protein deficiency.

Lack of protein in food can cause severe dystrophy in children – *kwashiorkor* [1]. The occurrence of serious diseases (dysentery, food poisoning and etc.) is associated with nutrition. *Kwashiorkor* is a disease marked by severe protein malnutrition and bilateral extremity swelling. It usually affects infants and children, most often around the age of weaning through age 5.

The disease is seen in very severe cases of starvation and poverty-stricken regions worldwide. In the 1950s, it was recognized as a public health crisis by the World Health Organization.

However, there was a delay in its recognition, because most cases of childhood death were reported as being from diseases of the digestive system or infectious etiology.

Since then, various relief efforts were aimed at eradicating it. As scientists continued to investigate the natural history of the disease in children, they discovered something very striking.

Children who were dying from "digestive system diseases" and presenting with diarrhea, cough, coryza, and shortness of breath also were having symptoms of *kwashiorkor* during this time (pitting edema, anorexia, skin changes, etc.).

This finding led to the medical conundrum of whether kwashiorkor was the primary or the secondary cause of death. It was concluded to be the secondary cause of death because many cases of the disease would not have developed without the precipitating stress of diarrhea, dehydration, and other infectious diseases such as HIV and measles.

While *kwashiorkor* is a disease of edematous malnutrition, marasmus is similar in appearance. Marasmus is known also known as a wasting syndrome (malnutrition without edema). Children typically have a depletion of body fat stores, low weight for height, and reduced mid-upper arm circumference.

Other features of the disease can include thin, dry skin; a head that appears large relative to the body; an emaciated, weak appearance; bradycardia; hypotension; hypothermia; and thin, shrunken arms, thighs, and buttocks with redundant skin folds [1].

This problem reviews the evaluation and treatment of patients with *kwashiorkor* and highlights the

Author: Doctor of Chemistry, Professor the Department of Chemical and Biological Technologies, Faculty of Chemical Technology and Metallurgy, Georgian Technical University, Tbilisi, Georgia.
e-mail: m.matsaberidze@gtu.ge

role of the interprofessional medical and biological team in successfully managing this condition.

The diseases associated with protein-energy malnutrition include: cachexia, kwashiorkor and insanity. The most vulnerable group of the population in relation to the lack of protein is children, especially during breastfeeding and the first years of life - from 6 months to 4 years.

The disease of children, which developed as a result of protein deficiency - *kwashiorkor.* It is characterized by a slowdown in the growth and development of the child, a change in the color of the skin and hair, depigmentation, a change in the state of the mucous membranes, a deterioration in the functions of many systems, especially the digestive system.

In severe cases, edema and mental disorders are observed. In addition to children, pregnant women and nursing mothers suffer the most from hunger.

Protein deficiency occurs more often with a general lack of food, is accompanied by "hungry edema" and is characterized as alimentary dystrophy.

Having many children under conditions of malnutrition worsens the health of both mother and children. In cases where between two consecutive births of one mother passes less than two years, infant mortality doubles on average.

According to experts, the shortage of protein foods is most acute in the world food shortage. The situation is better with the production of carbohydrates and fats.

Today, the deficit of food protein is from 10 to 15 million tons per year. By 2050, it will reach 30 million tons. And already now, about half of the world's population suffers from protein deficiency, and this affects the health of generations and their mental development.

70% of all agricultural land in the world has already been given over to animal husbandry, and in general, 30% of all land has been developed for agricultural land in the world.

In other words, further expansion is no longer possible on a significant scale.

The right to food is an inclusive right. It's not just a right to a minimum intake of calories, protein, and other specific nutrients. It is the right to all the nutrients a person needs for a healthy and active life, as well as the means of accessing them.

The right to food can be described [2] as follows: The right to adequate food is realized when every human being, man, woman and child, alone or in community with others, at all times has the physical and economic means to access adequate food or has the means to do so receipt.

Sufficiency means that nutrition should meet nutritional needs, taking into account age, living conditions, health status, professional responsibilities, gender, etc. person. For example, if children's nutrition does not contain the nutrients necessary for their physical and mental development, it is not sufficient.

Another example of malnutrition would be the consumption of energy-intensive and low-nutrient foods, which can contribute to obesity and other diseases.

Food intended for human consumption must be safe and free from harmful substances, in particular contaminants arising from industrial or agricultural production, including pesticides, hormones or veterinary drugs.

Adequate nutrition must also be culturally appropriate. For example, food aid that contains food that is religiously or culturally prohibited among recipients, or food that is inconsistent with their eating habits, will not be culturally acceptable.

Many people think that the right to food means that governments have an obligation to distribute free food to anyone who needs it.

They conclude that this would be impractical or could lead to dependency. This opinion is wrong.

The right to food is not a right to be fed, but primarily a right to self-sufficiency in a dignified manner. In other words, people are supposed to satisfy their own needs through their own efforts and using their own resources.

In order to be able to do this, a person must live in conditions that allow him to either produce food or buy it. Man needs land, seeds, water and other resources to produce his own food, and money and market access are needed to buy food.

The right to food obliges states to provide an enabling environment in which people can use their full potential to produce or purchase foods that enable them to provide themselves and their families with adequate nutrition.

However, if people are not able to feed themselves using their own means, for example, because of an armed conflict, a natural disaster, or while in prison, then the state itself must provide them with food.

The denial of the right to food does not stem from the lack of food in the world It can be imagined that people face a denial of their right to food because there is not enough food to satisfy everyone. However, according to the FAO, the world produces enough food to feed the entire population of the planet [3].

The root cause of hunger and malnutrition is not lack of food, but lack of access to available food.

For example, people's access to food is hindered by poverty, social exclusion and discrimination not only in developing countries but also in some of the most economically developed countries where food is plentiful.

However, given factors such as population growth, the impact of possible climate change and

limited natural resources, governments must also make efforts in the long term to develop sustainable food production to ensure the availability of food for future generations.

The right to food is distinct from food security and food sovereignty. These three concepts, while somewhat overlapping, are nevertheless different. According to the FAO, food security exists "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences and promotes an active and healthy life" [3].

This is a precondition for the full enjoyment of the right to food. However, the concept of food security as such is not in itself a legal concept and does not impose obligations on stakeholders, nor does it empower them.

Food sovereignty is an emerging concept whereby peoples determine their own food policies and patterns of food production (particularly agriculture and fisheries), determine the extent to which they want to be self-sufficient, and protect domestic food production and regulate trade in order to fulfillment of sustainable development objectives.

The concept of food sovereignty is proposed as a concept to promote an alternative agricultural model, trade policy and practice that works in the interests of people's rights to food and safe, healthy and environmentally sustainable food production. The right to food sovereignty is enshrined in a number of national laws [4].

However, there is currently no international consensus on this concept. The right to food is a human right recognized in international law that entitles individuals to have access to adequate food and the resources necessary for the sustainable enjoyment of food security.

The right to food places legal obligations on States to overcome hunger and malnutrition and to realize food security for all. The right to food also covers the cross-border obligations of states, including those related to trade.

For example, the International Covenant on Economic, Social and Cultural Rights places an obligation on States parties to take the necessary measures to ensure that the world's food supply is equitably distributed [5] in accordance with needs (art. 11, para. 2 b).

While it does not prescribe any particular model for achieving such distribution, it does oblige States to ensure that their trade and other policies serve this purpose.

The right to food is also recognized in other international conventions for the protection of specific groups, such as the Convention on the Elimination of All Forms of Discrimination against Women [6] (1979), the Convention on the Rights of the Child [7] (1989) and the Convention on the Rights of Persons with Disabilities [8] (2006).

The right to food is also enshrined in some regional treaties, notably the Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social and Cultural Rights, known as the San Salvador Protocol [9] (1988), the African Charter on the Rights and Welfare of the Child [10] (1990, 2003) and the Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa [11] (2003).

Recognition of the right to food is also implied in the context of the realization of other rights. As interpreted by the African Commission on Human and Peoples' Rights, the right to food is implicitly protected by the African Charter on Human and Peoples' Rights [12] (1981) in the provisions relating to the right to life, the right to health and the right to economic, social and cultural development.

According to the Human Rights Committee, which oversees the implementation of the International Covenant on Civil and Political Rights (1966), the protection of the right to life requires states to take positive measures, in particular measures to eliminate malnutrition [13]. The Committee against Torture, which oversees the implementation of the Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (1984), has noted that the lack of adequate food in prisons can amount to inhuman and degrading treatment [14].

International humanitarian law also provides for the protection of civilians' and prisoners of war's access to food and water in times of armed conflict [15] and the prohibition of the deliberate use of civilian starvation as a method of warfare [16].

Under international criminal law, violations of these protections constitute war crimes. The deliberate creation of a famine, whether in wartime or in peacetime, can also qualify as genocide [17] or a crime against humanity [18].

A number of non-legally binding international human rights instruments, including recommendations, guidelines, resolutions or declarations, are also relevant to the right to food [19]. They are also called legal documents of a recommendatory nature.

They are adopted by States and used to guide the realization of the right to food [20].

One such legal instrument of a non-binding nature, which is also the most explicit and detailed, is the Voluntary Guidelines to Support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security (hereinafter referred to as the Right to Food Guidelines).

The Right to Food Guidelines [21] were adopted by consensus by the FAO Council in November

2004. They are a practical tool to help realize the right to adequate food. While they are not legally binding in and of themselves, their purpose is to reflect existing human rights standards and provide useful guidance to States on how they can implement their existing obligations.

They cover the full range of measures that governments should consider at the national level in order to create an enabling environment for people to feed themselves in a decent manner and to create appropriate safety nets for those who are unable to do so, as well as measures to hold governments accountable before the copyright holders.

The Right to Food Guidelines are intended for both States parties to the International Covenant on Economic, Social and Cultural Rights and non-parties, and for both developing and developed countries.

States are encouraged to use the Right to Food Guiding Principles when developing their national strategies and programs to combat hunger and malnutrition.

The Right to Food Guidelines also provide for the involvement of non-governmental organizations (NGOs), civil society organizations and the private sector in promoting and strengthening the progressive realization of the right to adequate food.

The vast majority of people suffering from hunger and malnutrition live in rural areas in destitute and marginalized conditions, struggling to survive. About 50% of the people suffering from hunger are smallholders and 20% landless villagers [22]. Another 10% live off cattle breeding, fishing and forest management. The remaining 20% live in urban areas [23].

The rural poor often have limited access to sufficient productive resources, such as land, water, fertilizers and seeds, as well as markets, information and technology.

Very often, lack of access to land and other productive resources can lead to the denial of the right to food, as most individuals and households in rural areas depend on such resources either to produce food for their own consumption or as a source of income to buy the food they need. For example, denial of access to land may occur in the context of unfair competition for land from large agribusinesses, extractive industries or development projects.

With such competition, the rural poor are often at a severe disadvantage as a result of discrimination and violations of various human rights, including exclusion from decision-making and from access to justice. Sometimes the denial of access to land takes the form of forced evictions.

Even where they are able to produce agricultural products, lack of access to markets may prevent them from selling their produce and purchasing other food items needed for an adequate diet.

Lack of access to education, including vocational training, and to information and technology may also prevent them from improving productivity and protecting the environment or gaining knowledge about nutrition.

Landless workers, such as harvesters and agricultural workers, face denial of their right to food when they cannot afford adequate food and other basic needs due to excessively low wages. They also cannot enjoy the freedom of association needed to negotiate job security and decent wages.

Few countries have social security systems that work particularly well in rural areas. During times of economic hardship, rural poor people can face food insecurity. People living in poverty in urban areas are also highly vulnerable to violations of the right to food. Most of them provide themselves with food by buying food.

Therefore, paid work, including self-employment, is very important. When they find it difficult to find work, or when they receive meager wages that prevent them from purchasing food and other basic needs, such as health care, education and housing, this can undermine their right to food, as they have no other means to get food. For the self-employed, their access to food can also be negatively affected by discrimination in access to economic resources, such as credit, or access to market places.

When food is too expensive or their income too low, they may compensate by reducing the quality and quantity of food they eat, for example by choosing cheaper but less nutritious or less safe foods. In such cases, they cannot be considered to enjoy the right to food because the food they consume is insufficient.

Failures in the functioning of welfare programs or other safety nets, as well as their complete absence, further undermine the enjoyment of the right to food for those who have lost the means to provide for it themselves. As in rural areas, for people living in urban poverty, the inability to feed themselves is often attributed to social exclusion, in particular exclusion from education and training opportunities, access to information, decision-making in public affairs and from access to justice.

There is often a link between violations of the right to food in rural and urban areas. Hunger and malnutrition in rural areas are forcing people to move to urban areas in search of better living conditions. However, the right to food is often not realized in urban areas either.

The affected population may not be trained for employment in the jobs available in urban areas. Social protection schemes, even when they exist, may not be available to those who do not have proper documentation, such as residence registration, or who work in the informal economy.

According to the International Covenant on Economic, Social and Cultural Rights, States parties to it must take measures, including specific programs, to improve the methods of production, storage and distribution of food through the widespread use of technical and scientific knowledge, the dissemination of knowledge of the principles of nutrition and improving or reforming agricultural systems in such a way as to achieve the most efficient development and use of natural resources (Article 11).

The FAO Right to Food Guidelines provide detailed guidance on ensuring sustainable, nondiscriminatory and secure access to resources and assets, including labor, land, water, genetic resources for food and agriculture, services, etc. (guiding principle 8).

In order to guarantee the right to food to the poor in rural and urban areas, it is also necessary to ensure the realization of other human rights, such as freedom from forced eviction, the right to take part in public affairs and participate in rural development, freedom of association, the right to enjoy the benefits of scientific progress and its achievements, the right to work and other labor rights, the right to education and information, and the right to social security.

And the other hand, can the open data save the world from hunger? GODAN [24] is a British non-profit organization dedicated to the dissemination of open data. With the aim of making information about agriculture and food available, as the organization believes it helps to ensure food security in the world.

What is open data? Open data is data that is available to anyone for free use and re-publication without restrictions of copyright, patents or any other control mechanisms. *Open Data* can only be practical when it is shared in a way that people can understand. They need to be distributed in a standardized format and easily traceable to where the data was collected. Created in support of Open Data, GODAN's latest report is titled "Open Access and Open Data in PUSH Universities". PUSH[1] is an American organization known as Presidents United to Solve Hunger. GODAN[2] notes that they currently have over 700 partners working with them, including national governments, non-governmental organizations, international organizations and the private sector.

Open Data has proven to be one of the most important tools for disseminating scientific knowledge, spurring collaboration and creating innovation around the world. If we want to see progress towards global food security, then we must think about innovation.

As leaders in the creation and storage of knowledge and data, universities are natural partners in this global effort. Land-grant universities, many of which are part of PUSH, are already sharing their knowledge and best practices in agriculture and nutrition. PUSH and UFWH[3] - Universities Fighting World Hunger, want to help highlight the importance of open data as a resource for ending world hunger. By engaging universities and students in the collection and analysis of Open Data, PUSH and UFWH encourage both scientists and future leaders to find innovative ways to fight hunger on a global scale. UFWH is a growing global network of universities working in partnership to amplify the voice of the rising generation - a voice calling for a world free of hunger and malnutrition.

With widespread hunger, malnutrition and climate uncertainty around the world, university research [25] is essential to addressing some of the world's most pressing problems.

In a dynamic and diverse field such as agriculture and nutrition, effective data-driven solutions can help ensure sustainable livelihoods and drive progress towards the Sustainable Development Goal of Zero Hunger.

Researchers collect, analyze and reuse data, and the new knowledge they create helps make important decisions. governments and industry, while university librarians organize and curate data in large repositories [26].

Unfortunately, much of this data has been lost or locked up in closed vaults kept within university walls. If all the universities in the world developed an open data policy and published their data, much more effective decisions could be made. PUSH can pave the way. Its 99 universities whose presidents have pledged to unite in this endeavor.

The global fight against malnutrition and hunger has a unique opportunity to show by example, to demonstrate that it really saves lives and can improve the well-being of every person around the world. On the other hand, open access (OA) to information is free (for

[1] *Push Universities:* The sharing of research findings, as well as other data, is believed to increase the pace of innovation, research breakthroughs, and collaborative problem-solving. Often, however, these data are not readily available, visible, or accessible, resulting in needlessly duplicated research or critical gaps in information. This has led many public research funders (e.g., NSF, NIH & USAID), as well as private donors, to require public universities and other higher education institutions to develop or enhance data management plans that allow for open access and data sharing. While creating a culture with policies and infrastructure platforms that allows for open access and open data is a challenge, it is a challenge that is becoming increasingly necessary for universities to address //http://wp.auburn.edu/push/?page_id=1087.

[2] The Global Open Data for Agriculture and Nutrition (Godan) initiative seeks to support global efforts to make agricultural and nutritionally relevant data available, accessible, and usable for unrestricted use worldwide.

[3] UFWH is a growing, global network of universities working in partnership to amplify the voice of the rising generation – a voice calling for a world free from hunger and malnutrition. http://wp.auburn.edu/ufwh/

users), fast, permanent, full-text access in real time to scientific and educational materials, implemented for any user in the global information network, carried out mainly to research peer-reviewed journals.

The Internet has fundamentally changed the practical and economic conditions for the dissemination of scientific knowledge and cultural heritage. The Internet has provided a first-of-its kind opportunity for a comprehensive and interactive presentation of human knowledge, including cultural heritage, with guaranteed access to it from anywhere in the world.

For example, the Berlin Declaration, the purpose of which is to support the development of the Internet as a functional tool for the global dissemination of scientific knowledge and human reflection, as well as to formulate the necessary measures that will be considered by policy decision-makers, research organizations, support and development funds, libraries, archives and museums. The Berlin Declaration on Open Access to Scientific and Humanitarian Knowledge[4] [27] whose mission of dissemination of knowledge will only be partially fulfilled if information is not available to society in a simple and universal form. Continuing the development of traditional methods, the development of new opportunities for the dissemination of knowledge via the Internet on the principle of open access (the Open Access paradigm) should be increasingly promoted.

Open Access is defined as a comprehensive source of universal knowledge and cultural heritage recognized by the scientific community. To realize the idea of a comprehensive and public presentation of knowledge, the Internet of the future must be characterized by such properties as stability, interactivity and transparency. Information and software should be freely available and have a high degree of interoperability.

Open access as a desired method ideally involves the active participation of every copyright holder in the field of scientific publications and every manager of cultural heritage. Publications that comply with the Open Access principle cover original research results, source data and metadata, source materials, digital versions of photographic materials and graphics, as well as other scientific works in multimedia form.

II. Complex Problem of Protein Deficiency for Humanity

In the 21st century, the problem of protein deficiency nutrition for the global community continues to be existential. There is a tendency towards a decrease in the quality indicator of total protein, due to a quantitative decrease in animal proteins in the diet.

Based on an assessment of the amino acid composition, its adjustment taking into account the principles of mutual enrichment with the most rational ratio of nutrients, it is possible to create products whose biological value would approach the requirements of an ideal protein.

Correcting the qualitative inferiority of the protein component of food products is one of the main tasks in the meat processing industry, which is only possible by attracting the gold reserve of products of plant origin.

Of the nutrients necessary to meet human vital needs, the most valuable are proteins. The indispensability of their functions and the absence of mechanisms for the synthesis of a number of protein substances in the body clearly pose the problem of adequate protein nutrition to ensure human health and normal functioning.

The living and working conditions of modern man continue to place new demands on food: the need for fats decreases, and the need for protein increases. According to FAO/WHO, the norm of its consumption for humans is 90–100 g per day, including 60–70% protein of animal origin.

Proteins constitute the most expensive and scarce component of food rations, and therefore the desire to justify acceptable and realistic ways of direct use in nutrition of that part is quite obvious. Protein, which until recently was a food deficit and was utilized with low efficiency in animal husbandry.

Over the past years, the search for new sources of proteins, the development of technologies for protein preparations and the substantiation of ways of their rational use were implemented in a number of directions; for example, we can cite the industry of stress proteins production with their functional features.

Slowing down and eliminating the trends of an ever-increasing gap between the demand and production of protein with the subsequent elimination of its deficiency is most realistically achieved in two ways - the intensification of traditional methods of production of protein-containing products and the utilization of new proteins for food purposes as an additional source of increasing the stock of food protein.

One of the richest sources of protein is vegetable raw materials. A large number of proteins of plant origin and relatively low production costs make it

[4] Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, with mission of disseminating knowledge is only half complete if the information is not made widely and readily available to society. New possibilities of knowledge dissemination not only through the classical form but also and increasingly through the open access paradigm via the Internet have to be supported. We define open access as a comprehensive source of human knowledge and cultural heritage that has been approved by the scientific community. In order to realize the vision of a global and accessible representation of knowledge, the future Web has to be sustainable, interactive, and transparent.

possible to significantly compensate for the protein deficiency in human nutrition.

In the global food balance, plant proteins account for about 80%, and animal proteins for about 20% [28]. Plant sources are characterized by high protein content, low fat content, compared with animals, plant proteins have fewer sulfur-containing amino acids.

To obtain 1 kg of vegetable protein with intensive agricultural production consumes approximately 11 thousand kcal of fuel energy, per 1 kg of animal more than 75 thousand kcal. In livestock farming, unit labor costs are also 16 times higher: 53 kg per person hour, vegetable protein and only 3.2 kg of animal protein.

For economic reasons and promising functionality to solve the shortage problem to obtain complete dietary protein, it is necessary to use the entire variety of plants: oilseeds, legumes, grains, vegetables, vegetative organs of wild and cultivated plants.

III. Stress Proteins From Plants

The study of the reaction of the protein synthesizing system to stress in various living organisms has revealed the universality and conservatism of this phenomenon. Changes in the functioning of the genetic system are very similar among different eukaryotes, and in some cases have been identified in prokaryotes. Conservatism in the response of the protein synthesizing system of living organisms to stress clearly indicates that the biosynthesis of stress proteins is a fundamental and vital process that contributes to the adaptation and survival of organisms in extreme conditions.

The term “stress” (English stress - pressure, tension) was introduced into biological science by G. Selye in 1936 to characterize a similar reaction that occurs in the body under the influence of various stimuli. The state in which the body finds itself during such circumstances, is considered stressful and lasts from the beginning to the end of the stressor. Stressors include strong short-term exposure to environmental factors environments causing changes in sequence stages and reactions ending either in the adaptation of the living system to the damaging effects, or in the depletion of the reserve forces of the organism and its death.

As a rule, adaptive changes metabolic processes are the driving force evolution of organisms and the basis of survival in the environment. To understand the adaptation mechanisms of living organisms to unfavorable influences, responses at various hierarchical levels are studied levels, ranging from population to molecular. Particular attention is paid to studying features of protein biosynthesis under stress conditions.

The first information about reversible changes in protein system of living cells under the influence of high temperatures (up to 45 ^{o}C) appeared in the 60s XX-century Italian researcher Ferruccio Ritossa[5] discovered that under the influence of a temperature of 37 ^{o}C, giant puffs of Drosophila chromosomes.

It was later found that this phenomenon is associated with the de novo synthesis of a specific group of proteins, which are called “heat shock proteins” (HSPs). Today's synthesis HSPs in response to heat stress have been identified in a wide range of organisms - from bacteria to humans.

As a result of research carried out in a number of laboratories around the world, the spectrum of HSPs of various higher plants, in particular soybeans, corn, tobacco, carrots, lilies, cotton, etc., has been studied in detail. The synthesis of HSPs begins within 15 minutes after the action of a heat shock and lasts 6–8 hours.

Maximum synthesis of HSP occurs during the first 2.5 hours. As a result of heat shock, high and low molecular weight proteins are formed. Most HSPs synthesized in plants, unlike other living organisms, belong to the category of low molecular weight (molecular weight 15–18 kDa - kilodalton). High-molecular-weight plant HSPs are less diverse in compared to HSPs from insects, mammals and yeast. The process of HSP biosynthesis involves the nuclear and cytoplasmic genetic systems, while the proteins themselves are localized primarily in the cytoplasm, forming heat shock granules.

Heat shock granules allow the plant to maintain mRNAs necessary for rapid transition to repair processes. The formation of HSPs is preceded by de novo synthesis of heat shock mRNA, which occurs in the first 3–5 minutes of stress exposure and lasts from 1 to 4 hours, after which it gradually decreases [29].

Stress proteins (SPs) are a diverse group of proteins that are synthesized at increased levels when cells are exposed to either intracellular or extracellular stressful stimuli. They exhibit protective effects against stresses. Stress proteins include heat shock proteins (HSPs), RNA chaperone protein (RNPs), and proteins mainly function in the endoplasmic reticulum (ER): peptidyl-propyl isomerases, protein disulfide isomerases (PDIs) and the lectin-binding chaperone system.

SPs are ubiquitously expressed in all kind of cells, triggering signal cascades for neutralizing and eradicating the stresses occurring both intracellularly (e.g., pathogen invasion) and extracellularly (e.g., starvation, stimulation by cytokines/chemokines or hormones).

[5] Ferruccio Ritossa (February 25, 1936 – January 9, 2014) was an Italian geneticist best known for his discovery of the heat shock response in the model organism Drosophila (fruit flies) - https://en.wikipedia.org/wiki/Ferruccio_Ritossa.

Responses triggered by SPs can either activate pathways to promote cell survival or initiate cell death (i.e., apoptosis, necrosis, pyroptosis[6] or autophagic cell death) for eliminating the damaged cells to protect a particular organ/tissue under given conditions.

It is widely noted that the dysregulation of stress proteins is associated with a variety of human diseases, including cardiovascular diseases, neurodegenerative diseases (e.g., Parkinson's diseases, Alzheimer disease), stroke, human cancers and infectious diseases.

As SPs also attract a great interest as potential antiviral targets (e.g., COVID-19), interesting the present progress and challenges in this area of HSP-based drug development, as well as with compounds already under clinical evaluation [30].

Interest in the heat shock proteins (HSPs), as a natural physiological toolkit of living organisms, has ranged from their chaperone function in nascent proteins to the remedial role following cell stress.

As part of the defense system, HSPs guarantee cell tolerance against a variety of stressors, including exercise, oxidative stress, hyper and hypothermia, hyper and hypoxia and improper diets.

For the past couple of decades, research on functional foods has revealed a number of substances likely to trigger cell protection through mechanisms that involve the induction of HSP expression.

Summarized the occurrence of the most easily inducible HSPs and describe the effects of dietary proteins, peptides, amino acids, probiotics, high-fat diets and other food-derived substances reported to induce HSP response in animals and humans' studies [31].

The authors [32] of an extensive scientific review came to interesting conclusions regarding the function of stress proteins: Heat shock proteins (HSPs) encompass both extrinsic chaperones and stress proteins. These proteins, with molecular weights ranging from 14 to 120 kDa, are conserved across all living organisms and are expressed in response to stress.

The upregulation of specific genes triggers the synthesis of HSPs, facilitated by the interaction between heat shock factors and gene promoter regions.

Notably, HSPs function as chaperones or helper molecules in various cellular processes involving lipids and proteins, and their upregulation is not limited to heat-induced stress but also occurs in response to anoxia, acidosis, hypoxia, toxins, ischemia, protein breakdown, and microbial infection.

HSPs play a vital role in regulating protein synthesis in cells. They assist in the folding and assembly of other cellular proteins, primarily through HSP families such as HSP70 and HSP90.

Additionally, the process of the folding, translocation, and aggregation of proteins is governed by the dynamic partitioning facilitated by HSPs throughout the cell. Beyond their involvement in protein metabolism, HSPs also exert a significant influence on apoptosis, the immune system, and various characteristics of inflammation.

The immunity of aquatic organisms, including shrimp, fish, and shellfish, relies heavily on the development of inflammation, as well as non-specific and specific immune responses to viral and bacterial infections.

Recent advancements in aquatic research have demonstrated that the HSP levels in populations of fish, shrimp, and shellfish can be increased through non-traumatic means such as water or oral administration of HSP stimulants, exogenous HSPs, and heat induction. These methods have proven useful in reducing physical stress and trauma, while also facilitating sustainable husbandry practices such as vaccination and transportation, thereby offering health benefits.

Hence, the present review discusses the importance of HSPs in different tissues in aquatic organisms (fish, shrimp), and their expression levels during pathogen invasion; this gives new insights into the significance of HSPs in invertebrates.

IV. Instead of a Conclusion

Some evidence for decision making in food strategy and food science

From a wide list of high-quality literature for making decisions and teaching both food and nutritional strategies, we can gratefully mention the monographic textbook compiled by Bibek Ray - "Fundamental food microbiology" (Third Edition) [33].

Introductory food microbiology is a required course for undergraduates majoring in food science. In some form it is also taught in several other programs, such as microbiology, public health, nutrition and dietetics, and veterinary science.

For the majority of food scientists, except those majoring in food microbiology, this single course forms the basis of the study of microorganisms and their interactions to food.

Food microbiology is probably the only course that provides information on the interaction of food and microorganisms.

[6] Pyroptosis has received more and more attention because of its association with innate immunity and disease. The research scope of pyroptosis has expanded with the discovery of the gasdermin family(the main effector of inflammatory regulated cell death (or pyroptosis) - https://www.nature.com/articles/s41575-023-00743-w. A great deal of evidence shows that pyroptosis can affect the development of tumors. Pyroptosis is a double-edged sword for tumors. The rational use of this dual effect will help us further explore the formation and development of tumors, and provide ideas for patients to develop new drugs based on pyroptosis. https://www.nature.com/articles/s41392-021-00507-5

This book was written with the major objective of relating interaction of microorganisms and food in relation to food bioprocessing, food spoilage, and foodborne diseases.

Thus, it will be useful as a text in the introductory food microbiology courses taught under various programs and disciplines.

In addition, it will be a valuable reference for those directly and indirectly involved in food and microbiology, including individuals in:

- academic institutions;
- research institutions;
- federal, state, and local government agencies;
- food industries;
- food consultants;
- and even food lobbyists.

The subject matter is divided into seven sections. For undergraduate teaching, the first six sections can be taught as a semester course;

Section VII (Appendices) can be used as advanced information for an undergraduate course which contains materials that are either taught in other courses, such as advanced food microbiology, or food safety courses and laboratory courses.

Section I describes the history of food microbiology, characteristics of microorganisms important in foods, their sources, and significance. Section II deals with microbial growth and metabolism of food, and the significance of microbial sublethal injury and bacterial sporulation in foods.

Section III explains the different beneficial uses of microorganisms, which include starter cultures, bioprocessing, bio preservation, and probiotics.

Section IV deals with spoilage of foods by microorganisms and their enzymes and methods used to determine food spoilage. In addition, there is a chapter on problems and solutions of some emerging spoilage bacteria in refrigerated foods.

Section V deals with foodborne pathogens associated with intoxication, infections, and toxic infections and those considered to be opportunistic pathogens, as well as pathogenic parasites and algae. In addition, a chapter has been included on emerging pathogens and a chapter on indicators of pathogens.

Section VI discusses different methods used to control undesirable microorganisms for the safety and stability of food. A chapter on new nonthermal methods and a chapter on the hurdle concept in food preservation are included.

The materials in each chapter are arranged in logical, systematic, and concise sequences.

V. Globally Universal GS1 System: Accepted by Consumers, Businesses and Governments

Tracking the movement and location of goods is a set of measures that allows you to identify products throughout the supply chain in accordance with one or more criteria (for example, batch number or expiration date, etc.).

The focus is on tracking the movement of a product from its point of origin to its point of use.

Origin tracking allows you to determine the place of origin and associated characteristics of a specific product at any stage of the supply chain using several search criteria.

The globalization of trade, the increasing complexity of production processes and just-in-time supply chains, and the centralization of production and distribution processes require a fundamental reconsideration of most ways of delivering the “right” products to the consumer.

From an information process management perspective, the implementation of supply chain traceability systems requires all trading partners involved to systematically integrate the physical flow of materials, semi-finished and finished products with the information flow describing them.

All this requires a holistic view of the supply chain, which is best achieved by using a common language of business communication - the GS1[7] system.

Accepted by consumers, businesses and governments, this global, universal system provides a unique foundation to enable all required processes in traceability systems.

With the ability to globally uniquely identify trading and logistics units, participants and locations, the GS1 system is best suited for traceability.

GS1's unique global identifiers are the keys that provide access to all product history, application and location data.

VI. The GS1 Discovery APP[8]

In contrast to one-dimensional brochures and PowerPoint presentations, this web app – with its interactivity and flexibility – will help users to engage with GS1 in a new, modern way.

The GS1 Discovery App is an easy-to-use tool that shows GS1 standards "in action" throughout the supply chain – and the interoperability that standards-based business processes bring. This way we can all speak the "language of business" in a fun and engaging way.

[7] https://www.gs1.org/about
[8] https://discover.gs1.org

What better way to tell the story of supply chain visibility than tracing the travels of select products, as they make their way from source to consumer. It is easy to understand and allows users to create and explore connecting stories that show how GS1 standards benefit business. The GS1 Discovery App can be accessed anywhere and anytime on all computers and tablets.

VII. Food Industry and the Implementation of HACCP Systems

The National Advisory Committee (USA) on Microbiological Criteria for Foods (Committee) reconvened a Hazard Analysis and Critical Control Point (HACCP)[9] Working Group in 1995.

The Committee again endorses HACCP as an effective and rational means of assuring food safety from harvest to consumption. Preventing problems from occurring is the paramount goal underlying any HACCP system. Seven basic principles are employed in the development of HACCP plans that meet the stated goal.

These principles include hazard analysis, CCP identification, establishing critical limits, monitoring procedures, corrective actions, verification procedures, and record-keeping and documentation. Under such systems, if a deviation occurs indicating that control has been lost, the deviation is detected and appropriate steps are taken to reestablish control in a timely manner to assure that potentially hazardous products do not reach the consumer.

In the application of HACCP, the use of microbiological testing is seldom an effective means of monitoring CCPs because of the time required to obtain results. In most instances, monitoring of CCPs can best be accomplished through the use of physical and chemical tests, and through visual observations. Microbiological criteria do, however, play a role in verifying that the overall HACCP system is working.

The Committee believes that the HACCP principles should be standardized to provide uniformity in training and applying the HACCP system by industry and government. In accordance with the National Academy of Sciences recommendation, the HACCP system must be developed by each food establishment and tailored to its individual product, processing and distribution conditions.

In keeping with the Committee's charge to provide recommendations to its sponsoring agencies regarding microbiological food safety issues, this document focuses on this area. The Committee recognizes that in order to assure food safety, properly designed HACCP systems must also consider chemical and physical hazards in addition to other biological hazards.

For a successful HACCP program to be properly implemented, management must be committed to a HACCP approach. A commitment by management will indicate an awareness of the benefits and costs of HACCP and include education and training of employees. Benefits, in addition to enhanced assurance of food safety, are better use of resources and timely response to problems.

Conflicts of Interest

The author declares no conflicts of interest.

References Références Referencias

1. Onecia Benjamin; Sarah L. Lappin // Kwashiorkor // https://www.ncbi.nlm.nih.gov/books/NBK507876/
2. Right to Food curriculum - this curriculum was authored by Mauricio Rosales, Arne Oshaug, Maarten Immink and Beatrice Girardini, it's is the educational development within human rights in general, and the right to adequate food in particular // Food and Agriculture Organization of the United Nations Rome, 2009. //https://www.fao.org/3/i0851e/i0851e.pdf
3. Fao, the State of Food Insecurity in the World 2001 (Rome, 2001); The Right to Adequate Food Fact Sheet No.34. //https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
4. E.g., 2008 Constitution of Ecuador, 2008 Organic Law of Food Security and Food Sovereignty of Venezuela (Bolivarian Republic of) and 2007 Constitution of Bolivia (Pluractional State of) // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
5. Fao, The State of Food Insecurity in the World 2001 (Rome, 2001) //https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
6. The Convention on the Elimination of All Forms of Discrimination against Women recognizes the right of pregnant and lactating women to nutrition in article 12 (2) in the context of maternity protection. https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
7. The Convention on the Rights of the Child recognizes the right of children to adequate nutrition in article 24 (2) (c) and (e) in the context of the right to health and in article 27 (3) in the context of the right to an adequate standard of living // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
8. The Convention on the Rights of Persons with Disabilities recognizes the right to food in article 25 (f) in the context of the right to health and in article 28 (1) in the context of the right to an adequate standard of living and social protection // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf

[9] https://www.fda.gov/food/hazard-analysis-critical-control-point-haccp/haccp-principles-application-guidelines

9. The Protocol of San Salvador recognizes the right to food in article 12. It also addresses it in article 17 in the context of the protection of the elderly // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
10. The African Charter on the Rights and Welfare of the Child recognizes the right of children to nutrition in article 14 (2) (c), (d) and (h) in the context of the right to health and health services // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
11. The Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa recognizes the right to food in article 15. It also addresses the right of pregnant and breastfeeding women to nutrition in article 14 (2) (b) // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
12. The Social and Economic Rights Action Center and the Center for Economic and Social Rights v. Nigeria, communication No. 155/96, para. 64 // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
13. Human Rights Committee, general comment No. 6 (1982) on the right to life, para. 5. // https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
14. CAT/C/CR/33/1, para. 6 (h). //https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
15. Geneva Convention III relative to the Treatment of Prisoners of War (1949), arts. 20 and 26, Geneva Convention IV relative to the Protection of Civilian Persons in Times of War (1949), arts. 23, 36, 49, 55 and 89.
16. Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), art. 54, and Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of Non-International Armed Conflicts (Protocol II), art. 14.
17. Rome Statute of the International Criminal Court, art. 8 (2) (b) (xxv).
18. Claude Pilloud†, Jean De Preux, Yves Sandoz, Bruno Zimmermann, Philippe Eberlin, Hans-Peter Gasser, Claude F. Wenger // (Protocol I) Philippe Eberlin (Annex I); Sylvie-S. Junod (Protocol II); with the collaboration of Jean Pictet // Protocol Additional to the Geneva Conventions of 12 August 1949, and relating to the Protection of Victims of International Armed Conflicts (Protocol I), 8 June 1977. // Commentary of 1987 Introduction to the Commentary on the Additional Protocols I and II of 8 June 1977 //https://ihl-databases.icrc.org/en/ihl-treaties/api-1977/introduction/commentary/1987
19. Rome Statute of the International Criminal Court, arts. 7 (1) (b) and 7 (2) (b). For further reading, see The Right to Adequate Food in Emergencies, FAO Legislative Study 77 (Rome, 2002).
20. FAO - Extracts from international and regional instruments and declarations, and other authoritative texts addressing the right to food, FAO Legislative Study 68 (Rome, 1999).
21. FAO, "The Voluntary Guidelines: An overview", The right to food: Putting it into practice briefs, available from www.fao.org
22. Halving Hunger…, pp. 3–4. //https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
23. Land is not only for cultivation but also necessary for grazing, hunting and gathering. For fisherfolk, access to rivers, lakes and sea would also be relevant. https://www.ohchr.org/sites/default/files/Documents/Publications/FactSheet34en.pdf
24. Public and Private Institutional Support for Open Data. https://www.godan.info/mission.
25. Anne Mims Adrian, Britni Edison, Ruthie Musiker and Jessica Hopkinson // Open Access & Open Data Policy at PUSH Universities // Editors: June Hinton, Harriet Giles, Jaime Adams, Megan Elliott and Kara Newby // Designer: Tashina Walp // © 2018 by Auburn University is a registered trademark. Auburn University is an equal opportunity employer/educational institution. http://wp.auburn.edu/push/wp-content/uploads/2018/06/GODAN-report.pdf
26. Digital Science Report \\ The State of Open Data 2017 \\ Foreword by Jean-Claude Burgelman \\ OCTOBER 2017 \\https://digital science. figshare. com/articles/report/The_State_of_Open_Data_Report_2017/5481187/1.
27. Content and software tools must be openly accessible and compatible //https://openaccess.mpg.de/Berlin-Declaration.
28. Antipova L.V., Martemyanova L.E. // Assessing the potential of plant protein sources for food production // Food Industry magazine No. 8, 2013, pp. 10-12. (in Russian).
29. Kosakovskaya I.V. Stress Proteins in Plants // National Academy of Sciences Of Ukraine, Institute of Botany // Kyiv 2008, P.150. (In Russian).
30. Wan, Q., Song, D., Li, H. *et al.* Stress proteins: the biological functions in virus infection, present and challenges for target-based antiviral drug development. Sig Transduct Target Ther 5, 125 (2020). https://doi.org/10.1038/s41392-020-00233-4
31. Dietary Nutrients and Bioactive Substances Modulate Heat Shock Protein (HSP) Expression: A Review // Nutrients. 2018 Jun; 10(6): 683. Published online 2018 May 28. https://doi.org/10.3390/nu10060683

32. Jeyachandran, S.; Chellapandian, H.; Park, K.; Kwak, I.-S. A Review on the Involvement of Heat Shock Proteins (Extrinsic Chaperones) in Response to Stress Conditions in Aquatic Organisms. Antioxidants 2023, 12, 1444. https://doi.org/10.3390/ antiox12071444
33. Ray, Bibek Fundamental food microbiology // Bibek Ray. -3rd ed. p. cm. Includes bibliographical references and index. ISBN 0-8493-1610-3 // http://nuristianah.lecture.ub.ac.id/files/2014/09/fundamental-food-microbiology.pdf

Global Journal of Medical Research: L
Nutrition & Food Science
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Biochemical Changes of Mancozeb-Induced Alternations in Testes and Thyroid Gland of Male Rats

By Ahmed Abdelrafea Mohamed Anwar, Prof. Hesham Zaki Ibrahim & Prof. Sabah Gaber El –Banna

Alexandria University

Abstract- Mancozeb manganese ethylene bis dithiocarbamate polymeric complex – with zinc salts is a very important protective non-systemic fungicide, classified as an ethylene bis dithiocarbamate fungicide. Mancozeb used for controlling fungal diseases for a wide variety of crops because of its broad-spectrum as fungicidal effects and high compatibility with agrochemicals. The objective of this study was to investigate the results of the fungicide mancozeb at different doses on some biochemical parameters, reproductive performance, and histological changes in testes and thyroid gland. The low amount equals 1/7 of LD_{50} manczeb-d_1, and the high amount equals 1/3.5 of LD_{50} mancozeb-d_1. Amounts of mancozeb (mancozeb-d1 and mancozeb-d_2) adjusted according to the rat's body weights. The results showed that mancozeb decreased plasma testosterone level, sperm count, viability, motility, and significantly ($P<0.05$) increased abnormal sperms, altered acrosome, and abnormal DNA. Treatment of rats with manczeb-d_1 and mancozeb-d_2 significantly ($P<0.05$) decreased T3.

Keywords: *mancozeb, rats, thyroid glands, testes, histology.*

GJMR-L Classification: *DDC Code: 612.44 LCC Code: QP188.T54*

Strictly as per the compliance and regulations of:

Biochemical Changes of Mancozeb-Induced Alternations in Testes and Thyroid Gland of Male Rats

Ahmed Abdelrafea Mohamed Anwar [α], Prof. Hesham Zaki Ibrahim [σ] & Prof. Sabah Gaber El –Banna [ρ]

Abstract- Mancozeb manganese ethylene bis dithiocarbamate polymeric complex – with zinc salts is a very important protective non-systemic fungicide, classified as an ethylene bis dithio-carbamate fungicide. Mancozeb used for controlling fungal diseases for a wide variety of crops because of its broad-spectrum as fungicidal effects and high compatibility with agrochemicals. The objective of this study was to investigate the results of the fungicide mancozeb at different doses on some biochemical parameters, reproductive performance, and histological changes in testes and thyroid gland. The low amount equals 1/7 of LD_{50} manczeb-d_1, and the high amount equals 1/3.5 of LD_{50} mancozeb-d_1. Amounts of mancozeb (mancozeb-d1 and mancozeb-d_2) adjusted according to the rat's body weights. The results showed that mancozeb decreased plasma testosterone level, sperm count, viability, motility, and significantly ($P<0.05$) increased abnormal sperms, altered acrosome, and abnormal DNA. Treatment of rats with manczeb-d_1 and mancozeb-d_2 significantly ($P<0.05$) decreased T3. Also, T4 significantly ($P<0.05$) fell in the group treated with mancozeb-d_2. Treatment of rats with mancozeb-d1, and mancozeb-d_2 significantly ($P<0.05$) increased TSH. Furthermore, the histological study showed that exposure to mancozeb reduced the number of mature spermatozoa, necrosis, and basal vacuoles observed in some tubules. Also, mancozeb reduces colloid in most follicles resulting in desquamation of the follicular epithelium into the lumen of the thyroid follicles. In conclusion, despite mancozeb exhibiting low acute toxicity, it has been shown to cause detrimental effects on reproduction, thyroid gland, and its secretion. For this reason, it is necessary to be careful when using mancozeb in agricultural areas and should take precautions.

Keywords: mancozeb, rats, thyroid glands, testes, histology.

I. Introduction

Mancozeb manganese ethylene bis dithio-carbamate polymeric complex with zinc salts is a very important protective non-systemic fungicide, classified as an ethylene bis dithio -carbamate fungicide. Ethylene bis (dithio-carbamate)s (EBDCs) are the most widely used classes of organic fungicides in the world because it can effect on abroad types of fungus, and high compatibility with agrochemicals[1]. The EBDCs registered for food uses in the United States are mancozeb, and zineb. They were first introduced during the 1940s are widely used. These compounds have low water solubility, which results in remaining on the surface of treated crops as superficial deposits[2]. Mancozeb consists of a zinc-rich shell surrounding a central nucleus of polymer-structured EBDC. This structure is highly stable, and the low solubility of the zinc shell means EBDC can pass through this layer and be deposited on the leaf surface[3]. Mancozeb is unstable in water and decomposed by light, heat, and moisture-producing; ethylene thiourea (ETU) and ethylene bis (isothiocyanate) sulphide (EBIS) and other degradation products such as glycine and ethylene urea (EU), which is further to CO_2 under aerobic conditions. ETU is relatively stable and has a high solubility in water, so it can contaminate groundwater. ETU and EBIS are the main responsible compounds for the toxic effects linked to this fungicide group. ETU has teratogenic, carcinogenic, immunotoxic, and mutagenic effects, and EBIS is toxic and causes peripheral paralysis and thyroid dysfunction[4].

Ethylene bis isothiocyanate sulfide (EBIS), converted to ethylene bis isothiocyanate (EBI) by UV light. Both EBIS and EBI are active toxicants and can interfere with and inactivate sulphydryl groups in enzymes and amino acids, leading to enzymatic disruptions, and inhibition of spore germination[3, 5].

Mancozeb and its metabolites are widespread in the environment and have toxic effects due to their ingestion, inhalation, and percutaneous absorption by non- target organisms. Exposures to mancozeb are associated with a neurotoxic, developmental disability, immunotoxic, and carcinogenic effects in humans and experimental animals. Recent toxicological evidence has shown an endocrine- disruptive effect of mancozeb. It can disrupt the pituitary gland leading to decreasing the release of stimulating thyroid hormone (TSH) and thyroid hormones triiodothyronine and tetraiodothyronine. Moreover, it decreases thyroid hormone synthesis or action by directly interacting with nuclear hormone

Author α: Department of Environmental Studies, Institute of Graduate Studies and Research Alexandria University, Egypt.
e-mail: ahmedabdelrafea431@gmail.com
Author σ: Prof. of Environmental Chemistry and Toxicology Department of Environmental Studies, Institute of Graduate Studies and Research Alexandria University, Egypt. e-mail: hz_ibrahim@yahoo.com
Author ρ: Professor of Biochemistry, Department of Environmental Studies, Institute of Graduate Studies and Research Alexandria University, Egypt. e-mail: sabah_gaber@yahoo.com

receptors, inhibiting thyroid peroxidase, and inhibiting iodine uptake. Also, it has toxic effects on endocrine systems, ovary, testes, and epididymis[6].

Experiments conducted on rodents have established that mancozeb and ETU can cross the placental barrier with significant potential to disrupt reproductive performance, cause DNA damage, and initiate tumors in fetal cells[7].

II. Materials and Methods

a) Animals, experimental design and sampling

This study was approved by the Ethical Committee of the Institutional Animals Care and Use, Alexandria, Egypt, and met all guidelines for their use.

Mancozeb (85%) was obtained from the central agriculture pesticide laboratory. Eighteen healthy adult male rats *(Rattus norvegicus)* with an average weight of (180±10)g were obtained from animal house, Faculty of Medicine, Alexandria University, and acclimated for two weeks before the experiment. They were assigned to 3 groups and housed in Universal galvanized wire cages at room temperature (22-25 °C) and in a photoperiod of 12h/day. Animals have been provided with a balanced commercial diet containing, 18% crude protein, 14% crude fiber, 2% fat, and 2600 Kcal DE/Kg feed.

Animals were divided randomly into three groups (6 animals each). Animals were maintained on food and water *ad libitum*. Doses of mancozeb have been prepared by dissolving in carboxy methylcellulose and adjusted according to the rat's body weights and given orally by gavages approximately at the same time each morning, three times per weekday after day for four weeks. Group I (control) was orally administered with carboxy methyl cellulose. Group II was orally administered with a dose equal to 700 mg/Kg body weight of mancozeb (1/7 LD50). Group III was orally administered with an amount equivelent to 1400 mg/Kg body weight of mancozeb (1/3.5 LD50).

The doses were chosen based on the previous study [8]. At the end of the treatment period, rats were sacrificed, blood was collected from the heart venacava, in heparinized tubes, and was centrifuged at 1,000xg for 15 min. Blood plasma was separated in Eppendorf tubes and stored at -80˚C till further investigations. Testes were isolated, weighed, then washed with saline and preserved at -80 ˚C for further biochemical studies. Parts of testes and thyroid glands used for histological studies kept in formalin (10%). The crude homogenates of the testes were prepared according to Greer [9].

b) Testes homogenate biochemical assay and blood plasma enzymes and hormonal assay

Acid phosphatase (ACP; EC 3.1.3.2) was determined according to Daniel[10], Fructose was determined according to Foreman[11]. Enzyme-linked immunosorbent assay (ELISA) of testosterone was determined according to Nash[12], while T3 and T4 were determined according to Thakur[13] and TSH was determined according to Liu[14]. Biochemicals and hormonal kits have been purchased from BioSystems Company.

c) Sperm collection and analysis

Immediately after decapitation, the rat's testes and epididymis were removed, cleaned from accessory tissues, and sperm collection was performed according to Trošić[15]. Sperm viability has been assessed by the eosin Y stain and the motility of sperm was assayed by the number of sperm that could move in a line. The percentage of viable sperm and the motility of sperm were calculated according to Wyrobek and Bruce[16]. The integrity of the acrosome was assessed using the Tejada acridine orange method[17, 18].

d) Histological examination

Parts of testes and thyroid glands were fixed in 10 % formalin solution, embedded in paraffin wax, and cut with a microtome for 5µ thick sections. The sections were stained by Hematoxylin and Eosin (H&E) stains and microscopically studied to evaluate their morphology[19].

e) Statistical Analysis

The data were analyzed using a one-way analysis of variance (ANOVA) followed by Duncan's multiple comparisons. $P<0.05$ was statically significant according to Norušis[20].

III. Results

a) Effects of Mancozeb on acid phosphatase (ACP) in blood plasma and testes homogenate and fructose level in testes homogenate of male rat

The present study showed that, treatment of rats with mancozeb-d_1 increased ACP activity in blood plasma when compared to the control group, while in the group treated with Mancozeb-d_2, ACP activity decreased when compared to control. Furthermore, in testes, homogenate treatment of rats with Mancozeb-d_1 and Mancozeb-d_2 decreased ACP activity and fructose level when compared to the control group (Table1).

b) Effects of Mancozeb on testosterone and sperm quality

Treatment of rats with Mancozeb decreased testosterone when compared to the control group. Also, Mancozeb decreased sperm motility, viability, and increased the number of total abnormal sperm, altered acrosome, and abnormal DNA when compared to the control group (Table 2).

c) Effects of Mancozeb on thyroid hormones in blood plasma

Results presented in Table 3 showed that, treatment of rats with Mancozeb-d_1 and Mancozeb-d_2 decreased T3 and T4 when compared to the control group. Treatment of rats with Mancozeb-d_2 decreased

TSH when compared to the control group, while treatment with Mancozeb-d1 increased TSH when compared to the control group.

Table 1: Effects of Mancozeb on acid phosphatase (ACP) in blood plasma and testes homogenate and fructose level in testes homogenate of male rat

Parameters	Groups		
	Control	Mancozeb-d_1	Mancozeb-d_2
ACP (IU/L)	70.54 ± 1.15^b	76.60 ± 2.17^a	57.54 ± 1.54^c
ACP (IU/g tissue)	172.37 ± 5.81^a	160.39 ± 10.60^b	134.93 ± 4.26^c
Fructose (mg/g tissue)	151.95 ± 2.65^a	120.97 ± 3.88^b	122.91 ± 4.90^b

Results expressed as Mean ± SE, n=6
In Tables, the values denoted by different letters within the same row represent significant differences (P<0.05).
Mancozeb dose-1 (700mg/Kg) and Mancozeb dose-2 (1400mg/Kg), respectively

Table 2: Effects of Mancozeb on testosterone in blood plasma and sperm quality

Parameters	Groups		
	Control	Mancozeb-d_1	Mancozeb-d_2
Testosterone (μg/dL)	3.93 ± 0.114^a	3.20 ± 0.093^b	3.03 ± 0.088^b
Motility (%)	76.20 ± 0.583^a	66.70 ± 2.12^b	60.40 ± 2.56^c
Viability (%)	71.00 ± 0.548^a	61.00 ± 2.074^b	54.00 ± 2.793^c
Abnormal sperms(%)	5.30 ± 0.2^b	7.20 ± 0.490^a	8.20 ± 0.583^a
Altered acrosome(%)	5.40 ± 0.245^b	7.40 ± 0.510^a	7.20 ± 0.374^a
Abnormal DNA(%)	6.20 ± 0.583^b	7.20 ± 0.374^b	11.20 ± 0.490^a

Results expressed as Mean ± SE, n=6
In Tables, the values denoted by different letters within the same row represent significant differences (P<0.05).
Mancozeb dose-1 (700mg/Kg) and Mancozeb dose-2 (1400mg/Kg), respectively

Table 3: Effects of Mancozeb on thyroid hormones in blood plasma

Parameters	Groups		
	Control	Mancozeb-d_1	Mancozeb -d_2
T3 (μg/dL)	619.8 ± 18.04^a	490.00 ± 14.26^b	481.0 ± 14.00^b
T4 (μg/dL)	0.530 ± 0.015^a	0.214 ± 0.006^b	0.235 ± 0.007^b
TSH (μg/dL)	0.466 ± 0.014^b	0.807 ± 0.024^a	0.415 ± 0.012^c

Results expressed as Mean ± SE, n=6
In Tables, the values denoted by different letters within thesame row represent significant differences (P<0.05).
Mancozeb dose-1 (700mg/Kg) and Mancozeb dose-2 (1400mg/Kg), respectively

d) Effects of Mancozeb on histological changes in testes

Microscopic examination of control testes of male rats showed; typical testicular structure, normal spermatogonium cells (Spg) with its regular basophilic differentiated nuclei cells, normal spermatogenic (Figure 1). On the other hand, testes tissue of male rats treated with Mancozeb-d_1 (700 mg/kg); revealed large basal vacuoles in the cytoplasm cells, necrotic (N) spermatocytes (SPC) reduced volume of mature spermatozoa (SP) in some tubules. Necrosis was observed in some tubules (N)(Figure 2). Meanwhile, treatment rats with Mancozeb-d_2 (1400mg/kg) showed, dispatching of the tubular epithelium from primary spermatogonial (PSG) layer and reduction of the primary (PSP) and secondary (SSP) spermatids, with the presence of basal vacuoles (BV) (Figure 3).

e) Effects of mancozeb on histological changes in the thyroid gland

Microscopic examination of the control thyroid gland of male rats showed; typical architecture with follicular cells (F) with colloid (C), parafollicular cells (C-cells) (Figure 4). Meanwhile, the thyroid gland of male rats treated with Mancoeb-d_1 (700 mg/kg); showed vacuoles (V) in follicular epithelium, the follicular appeared flattened with flattened nuclei, reduction of colloid is evident; hyperplasia of parafollicular cells (C-

Cells). Moreover, desquamation (d) of the follicular epithelium into the lumen of the thyroid follicles (Figure 5). On the other hand, treatment of rats with Mancozeb-d_2 (1400mg/kg) showed interstitial edema (O), vacuolated erythrocytes (V), with variable size strands with irregular contours of the follicles (F), reduction of colloid in most follicles, hyperplasia of the follicular epithelium (Figure 6).

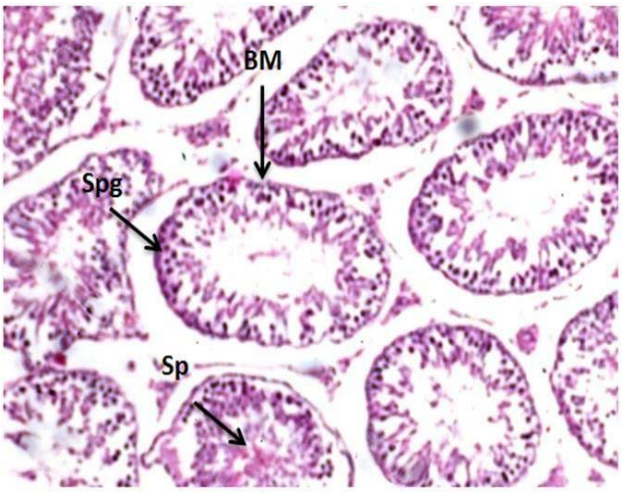


Figure (1): Photomicrographs of testes section of male rats control group *(H&EX200)*

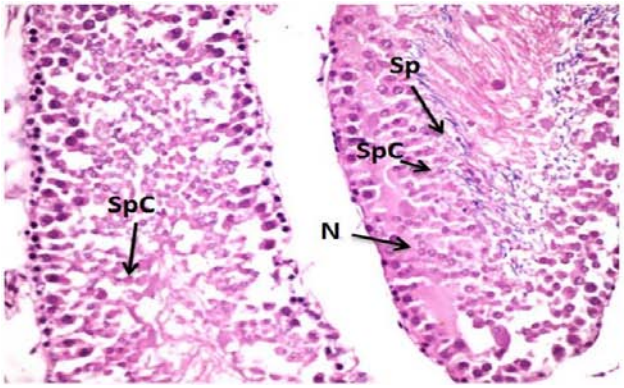


Figure (2): Photomicrographs of testes section of male rats treated with Manc-d1 (H&EX400)

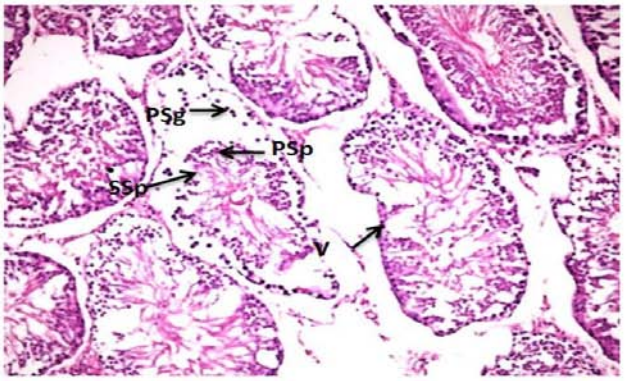


Figure (3): Photomicrographs of testes section of male rats treated with Manc-d2 (H&EX200)

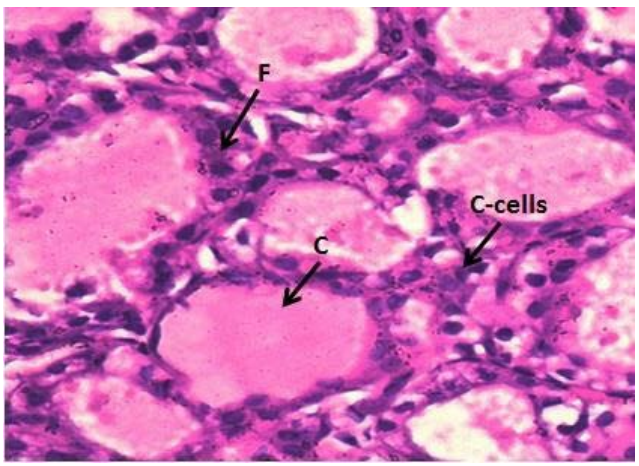


Figure (4): Photomicrographs of thyroid gland section of male rats control group *(H&EX400)*

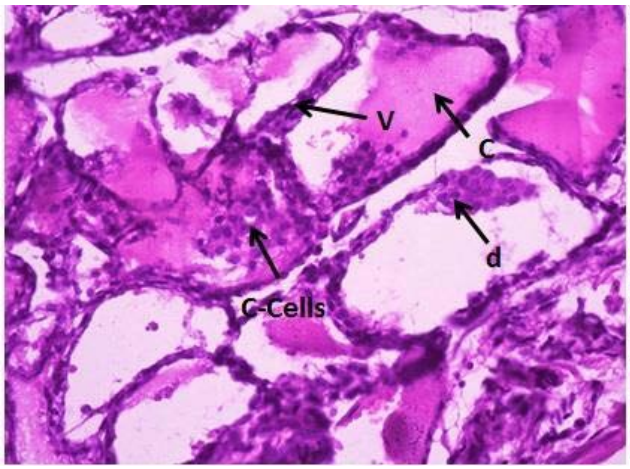


Figure (5): Photomicrographs of thyroid gland section of male rats treated with Manc-d1 (H&EX400)

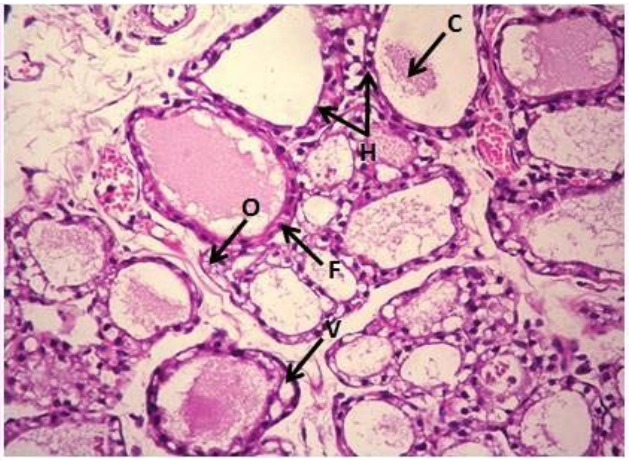


Figure (6): Photomicrographs of thyroid section of male rats treated with Manc-d2 (H&EX400)

IV. Discussion

Fructose has been used to indicate the seminal vesicle function, obstructive azoospermia, and inflammation of male accessory glands [21].

Increases in sperm concentration are often accompanied by a decrease in fructose level in seminal plasma, because sperm use fructose as the primary source of energy. However, other studies have also shown that fructose concentrations in seminal plasma of patients with oligozoospermia and azoospermia did not decrease as compared to ordinary men[22]. Fructose is produced endogenously within the human brain from glucose by the polyol pathway[23].

So, the present results revealed that, the decrease in fructose level means depression in the polyol pathway (fructose formation) and inactivity in cells due to treatment with mancozeb (manc).

Ananthan and Kumaran[24] showed that Mancozeb treatment (300 mg/kg body weight/day) for 60 days caused a significant increase in acid phosphatase in the testicular tissue of rats and increased activities in the serum. The decrease in acid phosphatase activity in the testes following the administration of Mancozeb could be attributed to either leakage of the enzyme into the extracellular fluid as a result of the disruption of the ordered lipid bilayer of the membrane or inhibition of the enzyme activity by this fungicide corresponding with the present results [24, 25, 26].

The decrease of testosterone might be responsible for the decreased sperm counts and motility and also morphological abnormality of testes. The insecticides may cause mitochondrial membrane impairment in Leydig cells and disrupt testosterone biosynthesis by diminishing the delivery of cholesterol into the mitochondria and decreasing the conversion of cholesterol to testosterone.

Acetamiprid-fed rats had fewer Leydig cells than regular diet-fed rats which may have been contributed to the reduction in testosterone biosynthesis[27].

Mancozeb and it's metabolites disturb endocrine gland action and its hormone secretion [6]. Treatment with mancozeb also changes the biochemical parameters of the reproductive tract. A fall in glycogen level may be due to interference in glucose metabolism. Fungicides induce inhibition of glycolytic enzymes, which affect the spermatozoa maturation and sperm motility. Inhibition of glycogen synthesis results in decreasing spermatogenesis process and reduction in serum testosterone[28].

Mancozeb has blocked the conversion of iodide to iodine. Inhibition in the iodide trapping and oxidizing process can lead to microscopic changes in the thyroid follicular cells and a reduced level of T4 [29]

The plasma TSH levels were increased upon chronic exposure to Mancozeb, indicating the usual negative feedback mechanism of the hypothalamus-pituitary- thyroid axis to low plasma T4 concentration. Chronic exposure to mancozeb has also been shown to reduce the synthesis and action of thyroid hormone through directly interacting with nuclear hormone receptors and inhibiting thyroid peroxidase and iodine uptake[6].

V. Conclusion

Mancozeb has adverse effects on the hormonal system, showing thyroid hormones disruption and decreased testosterone level resulting in abnormal sperms, thus reducing fertility, also exposure to mancozeb causes histological changes in the testes and thyroid gland.

Acknowledgement

In the name of “Allah” the most beneficent and the most merciful, who gave me strength and knowledge to complete this dissertation

Firstly, I would like to express my sincere gratitude and appreciation to Prof. Dr. Nasser Gamal El din Mohamed, Chief. Researcher of Pathology, Animal Health Research Institute, Dokki, Giza. Nevertheless, I am also grateful to Prof. Dr. Fatma Mahmoud Darwish, Chief Researcher of Pathology, Animal Health Research Institute, Dokki, Giza, for their help and guidance in the histological studies throughout this study.

References Références Referencias

1. López-Fernández, O., Pose-Juan, E., Rial-Otero, R., and Simal-Gándara, J. Effects of hydrochemistry variables on the half-life of mancozeb and on the hazard index associated to the sum of mancozeb and ethylenethiourea. Environmental research, 2017, 154, 253-260.
2. Hwang, E. S., Cash, J. N., and Zabik, M. J. Determination of degradation products and pathways of mancozeb and ethylenethiourea (ETU) in solutions due to ozone and chlorine dioxide treatments. Journal of agricultural and food chemistry, 2003, 51(5), 1341-1346.
3. Gullino, M. L., Tinivella, F., Garibaldi, A., Kemmitt, G. M., Bacci, L., and Sheppard, B. Mancozeb: past, present, and future. Plant Disease, 2010, 94(9), 1076-1087.
4. López-Fernández, O., Yáñez, R., Rial-Otero, R., and Simal-Gándara, J. Kinetic modelling of mancozeb hydrolysis and photolysis to ethylenethiourea and other byproducts in water. Water research, 2016, 102, 561-571.
5. Pirozzi, A. V. A., Stellavato, A., La Gatta, A., Lamberti, M., and Schiraldi, C. Mancozeb, a fungicide routinely used in agriculture, worsens nonalcoholic fatty liver disease in the human HepG2 cell model. Toxicology letters, 2016, 249, 1-4.
6. Kwon, D., Chung, H. K., Shin, W. S., Park, Y. S., Kwon, S. C., Song, J. S., and Park, B. G. Toxicological evaluation of dithiocarbamate fungicide mancozeb on the endocrine functions in male rats. Molecular and Cellular Toxicology, 2018, 14(1), 105-112.
7. Belpoggi, F., Soffritti, M., Guarino, M., Lambertini, L., Cevolani, D., and Maltoni, C. Results of Long-Term Experimental Studies on the Carcinogenicity of Ethylene-bis-Dithiocarbamate (Mancozeb) in Rats. Annals of the New York Academy of Sciences, 2002, 982(1), 123-136.
8. US Environmental Protection Agency (US EPA). Reregistration Eligibility Decision for Mancozeb. Reregistration Eligibility Decision for Mancozeb, 2005, 1-169.
9. Greer, J. P., Foerster, J., and Lukens, J. N. Wintrobe's Clinical Hematology (2Vol. Set). Lippincott Williams and Wilkins, 2003.
10. Daniel, O., Kind, P. R., and King, E. J. Urinary excretion of acid phosphatase. British Medical Journal, 1954, 1(4852), 19.
11. Foreman, D., Gaylor, L., Evans, E., and Trella, C. A modification of the Roe procedure for determination of fructose in tissues with increased specificity. Analytical Biochemistry, 1073, 56(2), 584–590.
12. Nash, J. P., Davail-Cuisset, B., Bhattacharyya, S., Suter, H. C., Le Menn, F., and Kime, D. E. An enzyme linked immunosorbant assay (ELISA) for testosterone, estradiol, and 17, 20β-dihydroxy-4-pregenen-3-one using acetylcholinesterase as tracer: application to measurement of diel patterns in rainbow trout (Oncorhynchus mykiss). Fish Physiology and Biochemistry, 2000, 22(4), 355–363.
13. Thakur, C., Saikia, T. C., and Yadav, R. N. S. Total Serum Levels of Triiodothyronine (T3) Thyroxine (T4) and Thyrotropine (TSH) in School going Children of Dibrugarh District: An Endemic Goitre Region of Assam. Indian Journal of Physiology and Pharmacology, 1997, 41, 167–170.
14. Liu, C., Hermsen, D., Domberg, J., Graeber, C., Hautzel, H., Duan, Y., and others. Comparison of M22-based ELISA and human-TSH-receptor-based luminescence assay for the measurement of thyrotropin receptor antibodies in patients with thyroid diseases. Hormone and Metabolic Research, 2008, 40(07), 479–483.
15. Trošić, I., Mataušić-Pišl, M., Pavičić, I., and Marjanović, A. M. Histological and cytological examination of rat reproductive tissue after short-time intermittent radiofrequency exposure. Archives of Industrial Hygiene and Toxicology, 2013, 64(4), 513–519.
16. Wyrobek, A. J., and Bruce, W. R. Chemical induction of sperm abnormalities in mice. Proceedings of the National Academy of Sciences, 1975, 72(11), 4425–4429.
17. Tejada, R. I., Mitchell, J. C., Norman, A., Marik, J. J., and Friedman, S. A test for the practical evaluation of male fertility by acridine orange (AO) fluorescence. Fertility and sterility, 1984, 42(1), 87-91
18. Erenpreiss, J., Bars, J., Lipatnikoval, V., and Erenpreisa, J. Comparative study of cytochemical tests for sperm chromatin integrity. Journal of Andrology, 2001, 22(1), 45–53.
19. Drury, R. A. B., and Wallington, E. A. Preparation and fixation of tissues. Carleton's Histological Technique, 1980, 5, 41–54.
20. Norušis, M. J. SPSS 14.0 guide to data analysis. Prentice Hall Upper Saddle River, N.J., 2006.
21. Desai, K. R., Moid, N., Patel, P. B., and Highland, H. N. Evaluation of Deltamethrin induced reproductive toxicity in male Swiss Albino mice. Asian Pacific Journal of Reproduction, 2016, 5(1), 24-30.

22. Trang, N. T., Huyen, V. T., Linh, N.T., and Sang, T. T. Seminal Fructose Concentration in Man Infertility and the Fructose Test's Meaning In Diagnosis Reason of Azoospermia Man. Biomedical Journal of Scientific and Technical Research, 2018, 8(1),1-5.
23. Hwang, J. J., Lihong Jiang, L., Hamza, M., Dai, F., Aguiar, R. B., Cline, G., Rothman, D. L., Mason, G., and Sherwin, R. S. The human brain produces fructosefrom glucose. JCI Insight, 2017, 2(4), 1-6.
24. Ananthan, G., and Kumaran, B. Effects of mancozeb on the specific activities of testicular phosphatases and Protective role of vitamin C in Albino rats. Bullettin of Environmental Pharmacology and Life Sciences, 2013, 2(7), 56-61.
25. Adjrah, Y., Karou, S. D., Agbonon, A., Eklu-Gadegbeku, K., de Souza, C., and Gbeassor, M. Effects of mancozeb-treated lettuce (Lactuca sativa) on wistar rat liver. Ethiopian Journal of Environmental Studies and Management, 2013, 6(1), 67-73.
26. Yahia, E., Aiche, M. A., Chouabbia, A., and Boulakoud, M. S. Subchronic mancozeb treatment induced liver toxicity via oxidative stress in male wistar rats. Communications in agricultural and applied biological sciences, 2014, 79(3), 553-559.
27. Ibrahim, H. Z., El-Banna, S. G., and El Rafea, A. A. Acetamiprid, Insecticide- Induced Oxidative Damage on Reproductive Parameters Male Rats. Alexandria Journal for Veterinary Sciences, 2010, 64(1).
28. Joshi, S. C., Gulati, N., and Gajraj, A. Evaluation of toxic impacts of mancozeb on testis in rats. Asian Journal of Experimental Sciences, 2005, 19(1), 73-83.
29. Kackar, R., Srivastava, M. K., and Raizada, R. B. Induction of gonadal toxicity to male rats after chronic exposure to mancozeb. Industrial health, 1997, 35(1), 104-111.

This page is intentionally left blank

Global Journal of Medical Research: L
Nutrition & Food Science
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN: 0975-5888

Comfort Foods and its Impact on Individual Psychology- A Review Article

By Usmaan Topiwala

Introduction- Stress can be considered as feeling when a person believes that demands exceed the personal and social resources the individual is able to mobilize and it affects its homeostasis. Stress on a rise in covid-19 pandemic due to socioeconomic conditions, loss of family members, uncertainty, decreased human interaction, etc [1]. People are increasingly spending more time at home because the educational institutes have turned towards online modes of teaching and many employees have been made to work from home.

Comfort foods can be defined as food to which a person has emotional and nostalgic attachment and have a component of unhealthiness, tastiness and are easy to prepare. It is not necessary that all these characteristics are found in all comfort foods but one of these is usually present.[3]

GJMR-L Classification: DDC Code: 664 LCC Code: TP370

Strictly as per the compliance and regulations of:

Comfort Foods and its Impact on Individual Psychology- A Review Article

Usmaan Topiwala

I. Introduction

Stress can be considered as feeling when a person believes that demands exceed the personal and social resources the individual is able to mobilize and it affects its homeostasis. Stress on a rise in covid-19 pandemic due to socioeconomic conditions, loss of family members, uncertainty, decreased human interaction, etc [1]. People are increasingly spending more time at home because the educational institutes have turned towards online modes of teaching and many employees have been made to work from home.

Comfort foods can be defined as food to which a person has emotional and nostalgic attachment and have a component of unhealthiness, tastiness and are easy to prepare. It is not necessary that all these characteristics are found in all comfort foods but one of these is usually present.[3]

This narrative review is meant to review the existing literature on relation between stress and eating of comfort foods. This will help us to arrive at a conclusion whether stress can increase consumption of comfort foods and vice-versa.

Changes in nutritional quality of meals and calorie intake have lead to a dramatic increase obesity over the past 30-40 years in developed and increasingly, in developing countries.[2]

Cognitive functions have been reported to be impaired due to obesity in both people and rodents .It has been observed in rats that exposure to a high fat and high sugar diet for as little as 1 week selectively impaired place recognition [2]. According to American Psychological association, nearly one -third of adults self- report overeating (hyperphagia) when stressed[4]. Eating more comfort foods after stress can be considered self medication for decreasing stress. This would dampen the response of body towards stress and leads to decrease in secretion of cortisol in long terms. This can lead to problems in handling stress in future and addiction to comfort foods.[5] Comfort eating is more likely to occur in women and obese. These groups can also become deficient in certain nutrients due to high consumption of only a certain type of nutrient[6] Also large amount of time is spend at home during the pandemic which would increase accesibility and need for comfort foods.[1] This study will be a great medium to create awareness among the vulnerable section ie women and obese thus decreasing their dependence on comfort foods

Author: Student at smt Nhlmmc. e-mail: topiwalausmaan@gmail.com

II. Methods

For the purpose of reviewing the literature, search was made on pubmed using keywords “comfort foods” and “stress” during May 2021. 208 results were reported. Studies included were providing a relation between comfort foods and stress on humans. Studies which were performed on animals i.e. rats and those related to heat or cold stress were excluded. 31 studies were identified to be useful for the review.

III. Discussion

Comfort foods are highly idiosyncratic across individuals. The very first taxonomic approach to comfort foods was proposed by Wansink, Cheney, and Chan (2003), and it was based on the physical characteristics of those foods.1 Wansink and colleagues conducted a two-part experiment. In the first study, they mailed a questionnaire to some randomly selected households to collect data on what kinds of foods people find more comforting. in the second study that was conducted over the phone; participants were asked to rate each comfort food identified in the initial study. They were asked if they considered it a comfort food, how guilty they felt after consuming it and how healthy they felt after consuming this food. Although the results suggested potential age and sex differences in comfort foods, this work also indicated the idiosyncratic nature of comfort foodsie comfort foods differ from person to person an would be based on that persons life experiences .

Certain research suggests that they are particularly likely to turn to such foods in times of high emotional arousal, regardless of which foods people choose as comfort foods. (e.g., DubLeBel, & Lu, 2005; Evers, Adriaanse, de Ridder, & de Witt Huberts, 2013). It has been reported that humans use consumption of comfort foods to attempt to distract themselves from, or alleviate, Negative emotions, or on the contrary, heighten the sensation of positive emotions (Dubé et al., 2005; O’Conner, Jones, Conner, McMillan, & Ferguson, 2008).

But people will usually seek Comfort food when they are in a negative affect state of stress. O’Conner Et

al. (2008) reported that increased consumption of high-fat and high-sugar Foods between meals are Correlated with interpersonal and work related stressors. A recent study also determined that more chocolate was consumed by people with High stress and lower cortisol levels as compared to those with low stress and high cortisol levels in a laboratory Study (Tryon, DeCant, & Laugero, 2013). Further, van Strien, Roelofs, And de Weerth (2013) found that people who scored high on an emotional eating scale combined with a lower (blunted) cortisol response Consumed more food after a stressful task than did those who scored High on an emotional eating scale combined with higher cortisol levels; Participants who scored low on the emotional eating scale did not show These differences.

Similarly, it was found that participants consumed The most of sweet, fat-rich foods when they were stressed when given an option to consume sweet, Salty, or bland foods of varying amounts of fat, (Oliver, Wardle, & Gibson, 2000). One study on contrary found that those who consume Comfort foods when stressed perceived these situations as less stressful When compared to those who did not consume comfort food (Finch & Tomiyama, 2015). This might lead to sense of euphoria about something that does not exist and this might lead to not facing problems.

Additionally, Labroo and Mukhopadhyay (2009) concluded that if people believe their positive mood is short-term, they would consume unhealthy food that will preserve their existing positive mood just the way people abuse drugs. This is the reason that there is a risk of addiction. In contrast, if people Believe their negative mood is short-term, they will consume healthier Food allowing them to focus on long-term needs because the negative Mood will alleviate itself. Similarly, if an emotion is thought to be long-Term, people will consume unhealthy food if they are in a negative mood in order to improve it, whereas they would consume healthy food In a positive mood because they are able to focus on their long-term needs.

Some investigations have focused on comfort food's Nostalgic components. It was found that along with comfort food providing psychological relief, people found it to be Comforting due to the consumption context and experience. (LeBel, Lu, & Dubé, 2008). It has been Suggested that social contexts and childhood experiences are important in The formation of life-long comfort food consumption. Spence (2017) Argues that strongest influence on whether a food will later become a Comfort food is based on past associations (e.g., memories and relationships) with Food. One of investigations in this nostalgia domain has Focused on social surrogacy (e.g., Troisi & Gabriel, 2011).The social surrogacy approach is a blend of Aspects of the emotional and nostalgic approach (Troisi & Gabriel, 2011; Troisi, Gabriel, Derrick, & Geisler, 2015; Troisi & Wright, 2017). Troisi and colleagues claim that the consumption of comfort Food can act as an emotional substitute to counteract loneliness. Each time the Food is consumed, memories of the emotions and inter Personal relationships associated with this food are activated (Ong, IJzerman, & Leung, 2015; Troisi & Gabriel, 2011; Troisi & Wright, 2017).It should be pointed out that one of the major ways of eradicating stress is focusing on building better interpersonal relationships. This need is being replaced by comfort foods thus making people dependent on comfort foods and infesting them with a lack of interest in developing interpersonal relationships.

1. PLS and cognitive restraint enhance the salience of NA as a trigger for stress-eating. Individuals with high chronic and perceived life stress have greater baseline and stress-induced NA [31,54], and show a relationship between stress-induced NA and consuming a larger percentage of portioned snack food [30l
2. Also Van Oudenhove et al. has observed that food intake without awareness (i.e., without visual, taste, and olfactory inputs) can modify emotions (2)
3. Approaches to treating obesity should certainly take the link between stress and food into account; the origin of stress should be identified and dealt with.

For young adult college students who are learning important self-management skills, intake of high-fat, non-nutritious "comfort foods" (e.g. heavy meals, sweets, salty snacks) in response to stress may be especially problematic. This would pave way for lifelong bad habits and obesity. Indeed, diet and other behavioral risk factors for obesity have been shown to remain similar from early life into adulthood (Craigie et al., 2011).

Limitations

Conclusion

References Références Referencias

1. Klatzkin RR, Dasani R, Warren M, et al. Negative affect is associated with increased stress-eating for women with high perceived life stress. *Physiol Behav*. 2019; 210: 112639. doi:10.1016/j.physbeh.2019.112639.
2. 3)Van Oudenhove L, et al. Fatty acid–induced gut-brain signaling attenuates neural and behavioral effects of sad emotion in humans. J Clin Invest. 2011; 121(8): 3094–3099. [PMC free article] [PubMed] [Google Scholar] [Ref list]
3. Cizza G, Rother KI. Was Feuerbach right: are we what we eat?. J Clin Invest. 2011; 121(8): 2969-2971. Doi: 10.1172/JCI58595
4. Craigie, A. M., Lake, A. A., Kelly, S. A., Adamson, A. J., & Mathers, J. C. (2011). Tracking of obesity-related behaviours from childhood to adulthood: A systematic review. Mauturitas, 70, 255–284. https://doi.org/10.1016/j.maturitas.2011.08.005

5. Wansink, B., Cheney, M. M., & Chan, N. (2003). Exploring comfort food preferences across age and gender. Physiology & Behavior, 79, 739–747. https://doi.org/10.1016/S0031-9384(03)00203-8.
6. Dubé, L., LeBel, J. L., & Lu, J. (2005). Affect asymmetry and comfort food consumption. Physiology & Behavior, 86, 559–567. https://doi.org/10.1016/j.physbeh.2005.08023.
7. Evers, C., Adriaanse, M., de Ridder, D. T. D., & de Witt Huberts, J. C. (2013). Good mood Food. Positive emotion as neglected trigger for food intake. Appetite, 68, 1–7. https://Doi.org/10.1016/j.appet.2013.04.007.
8. O'Conner, D. B., Jones, F., Conner, M., McMillan, B., & Ferguson, E. (2008). Effects of Daily hassles and eating style on eating behavior. Health Psychology, 27, S20–S31. https://doi.org/10.1037/0278-6133.27.1(Suppl.).S20.
9. Tryon, M. S., DeCant, R., & Laugero, K. D. (2013). Having your cake and eating it too: A Habit of comfort food may link chronic social stress exposure and acute stress-induced Cortisol hyporesponsiveness. Physiology & Behavior, 114–115, 32–37. https://doi.org/10.1016/j.physbeh.2013.02.018.
10. Van Strien, T., Roelofs, K., & de Weerth, C. (2013). Cortisol reactivity and distress-induced Emotional eating. Psychoneuro endocrinology, 38, 677–684. https://doi.org/10.1016/j.Psyneuen.2012.08.008.
11. Oliver, G., Wardle, J., & Gibson, E. L. (2000). Stress and food choice: A laboratory study. Psychosomatic Medicine, 62, 853–865. https://doi.org/10.1097/00006842-200011000-00016.
12. Finch, L. E., & Tomiyama, A. J. (2015). Comfort eating, psychological stress, and depressive symptoms in young adult women. Appetite, 95, 239–244. https://doi.org/10.1016/j.appet.2015.07.017.
13. Labroo, A. A., & Mukhopadhyay, A. (2009). Lay theories of emotion transience and the search for happiness: A fresh perspective on affect regulation. Journal of Consumer research, 36, 242–254. https://doi.org/10.1086/597159.
14. LeBel, J. L., Lu, J., & Dubé, L. (2008). Weakened biological signals: Highly-developed eating schemas amongst women are associated with maladaptive patterns of comfort food consumption. Physiology & Behavior, 94, 384–392. https://doi.org/10.1016/j.Physbeh.2008.02.005.
15. Troisi, J. D., & Gabriel, S. (2011). Chicken soup really is good for the soul: "Comfort food" fulfills the need to belong. Psychological Science, 22, 747–753. https://doi.org/10.1177/0956797611407931.
16. Troisi, J. D., Gabriel, S., Derrick, J. L., & Geisler, A. (2015). Threatened belonging and preference for comfort food among the securely attached. Appetite, 90, 58–64. https://doi.org/10.1016/j.appet.2015.02.029.
17. Troisi, J. D., & Wright, J. W. C. (2017). Comfort food: Nourishing our collective stomachs and our collective minds. Teaching of Psychology, 44, 78–84. https://doi.org/10.1177/0098628316679972.
18. Ong, L. S., IJzerman, H., & Leung, A. K.-Y. (2015). Is comfort food really good for the soul? A replication of Troisi and Gabriel's (2011) study 2. Frontiers in Psychology, 6, 1–9.

Global Journals Guidelines Handbook 2024

www.GlobalJournals.org

Memberships

Fellows/Associates of Medical Research Council

FMRC/AMRC Memberships

Introduction

FMRC/AMRC is the most prestigious membership of Global Journals accredited by Open Association of Research Society, U.S.A (OARS). The credentials of Fellow and Associate designations signify that the researcher has gained the knowledge of the fundamental and high-level concepts, and is a subject matter expert, proficient in an expertise course covering the professional code of conduct, and follows recognized standards of practice. The credentials are designated only to the researchers, scientists, and professionals that have been selected by a rigorous process by our Editorial Board and Management Board.

Associates of FMRC/AMRC are scientists and researchers from around the world are working on projects/researches that have huge potentials. Members support Global Journals' mission to advance technology for humanity and the profession.

FMRC

Fellow of Medical Research Council

FELLOW OF MEDICAL RESEARCH COUNCIL is the most prestigious membership of Global Journals. It is an award and membership granted to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Fellows are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Fellow Members.

Benefit

To the institution

Get letter of appreciation

Global Journals sends a letter of appreciation of author to the Dean or CEO of the University or Company of which author is a part, signed by editor in chief or chief author.

Exclusive Network

Get access to a closed network

A FMRC member gets access to a closed network of Tier 1 researchers and scientists with direct communication channel through our website. Fellows can reach out to other members or researchers directly. They should also be open to reaching out by other.

Career | Credibility | Exclusive | Reputation

Certificate

Certificate, LoR and Laser-Momento

Fellows receive a printed copy of a certificate signed by our Chief Author that may be used for academic purposes and a personal recommendation letter to the dean of member's university.

Career | Credibility | Exclusive | Reputation

Designation

Get honored title of membership

Fellows can use the honored title of membership. The “FMRC” is an honored title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., FMRC or William Walldroff, M.S., FMRC.

Career | Credibility | Exclusive | Reputation

Recognition on the Platform

Better visibility and citation

All the Fellow members of FMRC get a badge of "Leading Member of Global Journals" on the Research Community that distinguishes them from others. Additionally, the profile is also partially maintained by our team for better visibility and citation. All fellows get a dedicated page on the website with their biography.

Career | Credibility | Reputation

Future Work

Get discounts on the future publications

Fellows receive discounts on the future publications with Global Journals up to 60%. Through our recommendation programs, members also receive discounts on publications made with OARS affiliated organizations.

Career | Financial

GJ Internal Account

Unlimited forward of Emails

Fellows get secure and fast GJ work emails with unlimited storage of emails that they may use them as their primary email. For example,
john [AT] globaljournals [DOT] org.

Career | Credibility | Reputation

Premium Tools

Access to all the premium tools

To take future researches to the zenith, fellows receive access to all the premium tools that Global Journals have to offer along with the partnership with some of the best marketing leading tools out there.

Financial

Conferences & Events

Organize seminar/conference

Fellows are authorized to organize symposium/seminar/conference on behalf of Global Journal Incorporation (USA). They can also participate in the same organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent. Additionally, they get free research conferences (and others) alerts.

Career | Credibility | Financial

Early Invitations

Early invitations to all the symposiums, seminars, conferences

All fellows receive the early invitations to all the symposiums, seminars, conferences and webinars hosted by Global Journals in their subject.

Exclusive

Publishing Articles & Books

Earn 60% of sales proceeds

Fellows can publish articles (limited) without any fees. Also, they can earn up to 70% of sales proceeds from the sale of reference/review books/literature/publishing of research paper. The FMRC member can decide its price and we can help in making the right decision.

Exclusive | Financial

Reviewers

Get a remuneration of 15% of author fees

Fellow members are eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get a remuneration of 15% of author fees, taken from the author of a respective paper.

Financial

Access to Editorial Board

Become a member of the Editorial Board

Fellows and Associates may join as a member of the Editorial Board of Global Journals Incorporation (USA) after successful completion of three years as Fellow and as Peer Reviewer.

Career | Credibility | Exclusive | Reputation

And Much More

Get access to scientific museums and observatories across the globe

All members get access to 5 selected scientific museums and observatories across the globe. All researches published with Global Journals will be kept under deep archival facilities across regions for future protections and disaster recovery. They get 10 GB free secure cloud access for storing research files.

ASSOCIATE OF MEDICAL RESEARCH COUNCIL

ASSOCIATE OF MEDICAL RESEARCH COUNCIL is the membership of Global Journals awarded to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Associate membership can later be promoted to Fellow Membership. Associates are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Associate Members.

Benefit

To the institution

Get letter of appreciation

Global Journals sends a letter of appreciation of author to the Dean or CEO of the University or Company of which author is a part, signed by editor in chief or chief author.

Exclusive Network

Get access to a closed network

A AMRC member gets access to a closed network of Tier 2 researchers and scientists with direct communication channel through our website. Associates can reach out to other members or researchers directly. They should also be open to reaching out by other.

Career | Credibility | Exclusive | Reputation

Certificate

Certificate, LoR and Laser-Momento

Associates receive a printed copy of a certificate signed by our Chief Author that may be used for academic purposes and a personal recommendation letter to the dean of member's university.

Career | Credibility | Exclusive | Reputation

Designation

Get honored title of membership

Associates can use the honored title of membership. The “AMRC” is an honored title which is accorded to a person’s name viz. Dr. John E. Hall, Ph.D., AMRC or William Walldroff, M.S., AMRC.

Career | Credibility | Exclusive | Reputation

Recognition on the Platform

Better visibility and citation

All the Associate members of AMRC get a badge of "Leading Member of Global Journals" on the Research Community that distinguishes them from others. Additionally, the profile is also partially maintained by our team for better visibility and citation.

Career | Credibility | Reputation

Future Work

Get discounts on the future publications

Associates receive discounts on future publications with Global Journals up to 30%. Through our recommendation programs, members also receive discounts on publications made with OARS affiliated organizations.

Career | Financial

GJ Account

Unlimited forward of Emails

Associates get secure and fast GJ work emails with 5GB forward of emails that they may use them as their primary email. For example,
john [AT] globaljournals [DOT] org.

Career | Credibility | Reputation

Premium Tools

Access to all the premium tools

To take future researches to the zenith, fellows receive access to almost all the premium tools that Global Journals have to offer along with the partnership with some of the best marketing leading tools out there.

Financial

Conferences & Events

Organize seminar/conference

Associates are authorized to organize symposium/seminar/conference on behalf of Global Journal Incorporation (USA). They can also participate in the same organized by another institution as representative of Global Journal. In both the cases, it is mandatory for him to discuss with us and obtain our consent. Additionally, they get free research conferences (and others) alerts.

Career | Credibility | Financial

Early Invitations

Early invitations to all the symposiums, seminars, conferences

All associates receive the early invitations to all the symposiums, seminars, conferences and webinars hosted by Global Journals in their subject.

Exclusive

Publishing Articles & Books

Earn 60% of sales proceeds

Associates can publish articles (limited) without any fees. Also, they can earn up to 30-40% of sales proceeds from the sale of reference/review books/literature/publishing of research paper

Exclusive | Financial

Reviewers

Get a remuneration of 15% of author fees

Associate members are eligible to join as a paid peer reviewer at Global Journals Incorporation (USA) and can get a remuneration of 15% of author fees, taken from the author of a respective paper.

Financial

And Much More

Get access to scientific museums and observatories across the globe

All members get access to 2 selected scientific museums and observatories across the globe. All researches published with Global Journals will be kept under deep archival facilities across regions for future protections and disaster recovery. They get 5 GB free secure cloud access for storing research files.

Associate	Fellow	Research Group	Basic
$4800 **lifetime designation**	$6800 **lifetime designation**	$12500.00 **organizational**	APC **per article**
Certificate, LoR and Momento **2** discounted publishing/year **Gradation** of Research **10** research contacts/day **1 GB** Cloud Storage **GJ** Community Access	**Certificate,** LoR and Momento **Unlimited** discounted publishing/year **Gradation** of Research **Unlimited** research contacts/day **5 GB** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**Certificates,** LoRs and Momentos **Unlimited** free publishing/year **Gradation** of Research **Unlimited** research contacts/day **Unlimited** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**GJ** Community Access

Preferred Author Guidelines

We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from https://globaljournals.org/Template

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at submit@globaljournals.org or get in touch with chiefeditor@globaljournals.org if they wish to send the abstract before submission.

Before and during Submission

Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

1. Authors must go through the complete author guideline and understand and *agree to Global Journals' ethics and code of conduct,* along with author responsibilities.
2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s') names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

Declaration of Conflicts of Interest

It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

Policy on Plagiarism

Plagiarism is not acceptable in Global Journals submissions at all.

Plagiarized content will not be considered for publication. We reserve the right to inform authors' institutions about plagiarism detected either before or after publication. If plagiarism is identified, we will follow COPE guidelines:

Authors are solely responsible for all the plagiarism that is found. The author must not fabricate, falsify or plagiarize existing research data. The following, if copied, will be considered plagiarism:

- Words (language)
- Ideas
- Findings
- Writings
- Diagrams
- Graphs
- Illustrations
- Lectures

- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

Authorship Policies

Global Journals follows the definition of authorship set up by the Open Association of Research Society, USA. According to its guidelines, authorship criteria must be based on:

1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

Copyright

During submission of the manuscript, the author is confirming an exclusive license agreement with Global Journals which gives Global Journals the authority to reproduce, reuse, and republish authors' research. We also believe in flexible copyright terms where copyright may remain with authors/employers/institutions as well. Contact your editor after acceptance to choose your copyright policy. You may follow this form for copyright transfers.

Appealing Decisions

Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

Declaration of funding sources

Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
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.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

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

Format Structure

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

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

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

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

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

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Medical Research Paper

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

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

4. Use of computer is recommended: As you are doing research in the field of medical research then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

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

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

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

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

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

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

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

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

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.

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.

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

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

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

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

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

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

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

Index

save our planet

Global Journal of Medical Research

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

ISSN 9755896