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Role of Diet in Development of the Risk of Depression Among Geriatric Population: A Multi Centric Cross-Sectional Study in West Bengal

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ABSTRACT

The scarcity of literature reviews from India to assess the prevalence of psychiatric distresses along with drastic spreading of Non-communicable diseases (NCDs) among frailty geriatric Indian population and the potential beneficial roles of dietary management helps to encourage for finding importance the purpose of this study. Observational cross sectional study with analytic design was applied among the geriatric population (n=400) to conduct this research. From the entire population, 300 were collected from community of three different Medical Colleges and Hospitals' field practice area and another 100 were from hospital settings from Medical College and Hospital, Kolkata of West Bengal. In the socio-demographic scenario, majority were Hindu (78.5%), male (63.3%).The study participants were dispersed over several locations: 50.0% lived in hospital contexts, 21.5% lived in urban settings, and 28.3% lived in rural regions. With regard to NCDs, hypertension (p value *0.001), another cardiac outcome (p value *0.001) and diabetes mellitus (p value *0.004) were notably present in this population. In consideration with dietary pattern, the study findings indicate while depressive scores were significantly linked to vitamin C (chi square1.042,p value 0.001*),iron(chi square 0.942,p value<0.001*) and calcium (chi square 1.184,p value 0.004*)intake. Less intake of Vitamin C, iron and calcium are significantly associated with the development of depression among the geriatric population of West Bengal.

INTRODUCTION

On the verge of decreasing birth rates and rising life expectancy, the global population is ageing[1]. It is predicted that by 2050, there will be approximately two billion people in the globe who are 60 years of age or older 22% of the total population[1,2]. The necessity to support older people's health and well-being in order to support as independent, enjoyable and healthy an ageing process as possible is underscored by these demographic shifts[1].

Considering, the explosion of the life expectancy statistics, frailty, a phenomenon associated with ageing, comes parallelly. Interestingly, World Psychiatry Report showed that those with frailty and bipolar disorder-which is often categorized as a serious mental illness-had the highest risk of all-cause death (3.65 times greater than the non-frail non-psychiatric comparator group). This finding aligns with an extensive array of data that underscores the heightened occurrence of physical co-morbidities, particularly among individuals suffering from severe mental illnesses[3-5]. At the moment, Non-communicable diseases (NCDs) are the primary cause of death and morbidity worldwide. Nearly 41 Million (or 74%) deaths globally were brought on by NCDs., out of this, 17 Million deaths at the age of 70 years. A recent Lancet Commission Report suggests, the significantly increased frequency of physical co-morbidities, such as metabolic and cardiovascular disorders, which occur at a rate of up to double that of the general population, is one of the major factors contributing to years of life lost for this demographic. This report also showed, compared to individuals without mental health issues, those with a diagnosis of a psychological disorder had a 1.4-2.0 higher chance of acquiring cardio-metabolic diseases. For instance, there is a 40% increase in the likelihood of having a physical co-morbid diagnosis with major depressive disorder (MDD)[6]. The most recent worldwide report on ageing and health, nevertheless, reveals significant health disparities and challenges among the senior population, notably with regard to mental health[1,2]. The levels of health do not, however, correspond with the rise in lifespan. In this regard, there has been a growing body of research in the past few years on the impact of psychosocial factors on the mental health of geriatric population[7,8].

In this context, Nutritional Psychiatry Report has mentioned, nutritional intake has the ability to modify brain pathways associated with inflammation, oxidative stress, neuroplasticity, mitochondrial function and gut microbiota that may impact depression risk[9].Furthermore, new study has demonstrated the advantages of incorporating trace elements in the management and prevention of depression. Using statistical modelling techniques like factor analysis to identify food trends in the population being studied is one method (empirically-derived dietary patterns). Although these dietary patterns closely resemble the eating habits of the community under study, they are scarcely representative of an ideal diet and are unlikely to be replicated in other communities. Unlike these a posteriori approaches, a priori approaches provide dietary indices based on current understanding of what defines a "healthy" diet (dietary patterns that are hypothesis-oriented). Dietary indices demonstrating adherence to an optimal diet, which are based on a restricted set of certain food categories rather than specific nutrients, can be a highly beneficial tool for physicians to interact with patients[10].Though these results are not always consistent, recent evaluations have indicated that healthy eating corresponds to a reduced likelihood of depression or depressive disorders[11-13].

Therefore, despite having complexity of interrelationship between depressive outcomes and dietary management, this study has aimed to find out the relationship between diet pattern and the existence of psychological distresses of the geriatric community with frailty and co-existing Non-Communicable Diseases as well.

MATERIALS AND METHODS

This study is based on Observational Cross-sectional study with Analytical design. We have considered 60 and above years old people in our study, who residing in the rural, urban field practice area of three different Medical College and Hospital (Medical College and Hospital, Kolkata, Medinipur Medical College and Hospital, North Bengal Medical College and Hospital) of West Bengal have been chosen for this study. In hospital settings, Regional Geriatric Centres and the Wellness Clinic of Medical College and Hospital, Kolkata are also picked up for collecting data. In accordance with our study design, the inclusion criteria are people aged over 60 years and those who are willing to give consent for the study on the other hand exclusion criteria are patients suffering from critical and terminal illnesses and those who are with pre-existing psychiatric illnesses.

400 study participants from community as well as hospital settings were participated. From the overall data settings, 300 were collected from community and the rest were from hospital settings. Simple Random Sampling method has been used in rural and urban field practice area. On the other hand, considering the huge number of samples in hospital settings, we decided to choose Systematic Random Sampling for Geriatric OPD and wellness clinic. Following variables were collected during the span of study.

- **Patient Particulars:** With special reference to demography, steroid use, co-morbidities.
- Routine Clinical Examination.

- **The Geriatric Depression Scale (GDS) (Short Form):**a 15-item self-report assessment which was used to identify depression in the elderly.
- The 24-hour Dietary Recall (24 hr) approach.

For the dietary assessment, 24 hour recall method was chosen by our study team. Since this approach involves participants about the kind and amount of every meal and drink they have had over the previous 24 hours in order to get detailed, quantitative data on their diet, by analyzing such that details about food sources and methods of preparation are included.

Albeit there are numerous tools for measuring depression, the Geriatric depression Scale (GDS), which was developed by Yesavage has been widely evaluated and used with the elderly population[14]. By considering drawbacks of the previous version, a 15-item version was developed[15]. Depending on age, schooling and complaints, scores of 0-4 are regarded as no depression., 5-8 indicates mild depression., 9-15 indicates severe depression[15] and this is a globally accepted scale[17]. Here we have used the Short form of GDS.

Data were collected through interview method from the rural and urban field practice area of Medical College Kolkata, Regional Geriatric Centre and Wellness Clinic. The duration of each interview was approx one hour. For conducting the interview a Case Record Form was provided to each researcher to record all significant data from those respective communities. Data were tabulated in Microsoft Excel and analyze d in accordance with the Statistical methods with the help of SPSS software (Version 28).

The study protocol submitted to the Scientific advisory Committee and Ethics Committee for Human Research of Medical College & Hospital, Kolkata for ethical review and approval. Written informed consent was taken from all the subjects who participated in this study.

RESULTS AND DISCUSSIONS

Socio-Demographic: The study's participants exhibited a diverse demographic and health profile. In terms of gender, the majority was male (63.3%), while females accounted for 36.8% of the population. The study encompassed individuals from various religious backgrounds, with 78.5% identifying as Hindu, 19.0% as Muslim and 2.5% as Christian. The participants were distributed across different locations, with 28.3% residing in rural areas, 21.5% in urban settings and 50.0% within hospital environments. Education levels varied, encompassing a range from illiterate (29.3%) to those with a graduate or higher degree (12.8%). A significant portion of the participants had previous employment experience (58.0%) and 27.8% were currently employed. Most participants lived with their families (77.3%) and were financially dependent to varying degrees, with 35.8% being financially independent. Majority of family belongs to the upper class (46.8%), according to Modified B G Prasad Socioeconomic Status Scale,2022[17].Casting the look on the marital status of study participants, most are married (45.6%) followed by unmarried (29.5%) so one and so forth. Most of people are Positive family behavior was predominant (96.3%), and a minority reported negative family dynamics (3.8%) [Table-1].

In this study participants received a pension (19.0%), a portion of the participants was enrolled in welfare schemes (23.0%), primarily government schemes (90.2%).

Co-Morbidities and Depressive Outcomes: The study also captured data on various health conditions like Non Communicable diseases (NCDs), including diabetes (33.0%), hypertension (54.3%) and other medical issues like thyroid disorders (6.3%), chronic kidney disease (1.5%), respiratory diseases (10.3%), cardiac conditions (10.5%), muscular disorders (15.0%), neurological disorders (4.8%). These comprehensive findings provide a detailed and multifaceted overview of the study population, facilitating a deeper understanding of their demographic and health characteristics.

In this study population, majority has been suffered from mild depression (44.15%) and 12.25% are suffering from severe depression. Here types of coexisting NCDs like hypertension, diabetes mellitus and cardiac condition have influenced depressive outcomes significantly, as evidenced by p-values of 0.001*, 0.004*, 0.001* respectively [Table-2].

Dietary Pattern in Association with GDS: The nutritional analysis of the study revealed important data on dietary intake and health-related measures. Participants' mean daily energy intake was 1103.11 kcal (SD: 240.24), indicating variability in caloric consumption. Carbohydrate consumption averaged 167.51 grams (SD: 42.08) and Protein intake had a mean of 37.17 grams (SD: 19.36). Similarly, the average daily fat consumption was 29.17 grams (SD: 18.65). The study also assessed micronutrients, with beta-carotene intake at an average of 204.43 mcg (SD: 439.51). Vitamin C intake had a mean of 26.05 mg (SD: 18.90), Iron intake averaged 8.42 mg (SD: 3.02). Calcium intake had a mean of 145.32 mg (SD: 116.40). Zinc intake averaged 7.98 mg (SD: 1.74). Selenium (Se) intake had a mean of 25.12 mcg (SD: 6.00) and chromium (Cr) intake averaged 33.15 mcg (SD: 9.03). Additionally, participants had a mean Geriatric Depression Scale (GDS) score of 5.49 (SD: 3.53), with scores ranging from 0.00-15.00, reflecting variations in mood and mental health among the participants. These comprehensive findings offer insights into dietary habits and nutritional status, highlighting both the average intake levels and the considerable variability observed in the study cohort [Table-3].

Table-1: Distribution of Socio Demographic Variables and Status of Co-Morbidity Variables Among the Study Participates (n=400)

Sl. No.	Variables		Number	Percentage
1.	Gender	Male	253	63.3
		Female	147	36.8
2.	Religion	Hindu	314	78.5
		Muslim	76	19.0
		Christian	10	2.5
3.	Location of participants	Rural	114	28.3
		Urban	86	21.5
		Hospital	200	50.0
4.	Education	Illiterate	117	29.3
		Primary	132	32.8
		Middle School	19	4.8
		Secondary	58	14.5
		HS	23	5.8
		Graduate & Above	51	12.8
5.	Previous Employed	Yes	232	58.0
6.	Currently Employed	Yes	111	27.8
7.	Per capita Family income (INR)	Upper class (8220 & above	187	46.8
		Upper Middle Class (4110-8219)	73	18.3
		Middle Class (2465-4109)	69	17.3
		Lower Middle Class (1230-2464)	51	12.8
		Lower Class (<1230)	20	5.0
8.	Marital Status	Married	183	45.8
		Unmarried	118	29.5
		Widowed	55	13.8
		Separated	43	10.8
		Divorced	1	0.3
9.	Living with	Family	309	77.3
		Spouse	38	9.5
		Children	29	7.3
		Relatives	9	1.8
		Alone	15	3.8
10.	Financial Dependency	Independent	146	35.8
		Partially Dependent	85	21.3
		Completely Dependent	169	42.3
11.	Pension	Yes	76	19.0
12.	Welfare Scheme	Yes	92	23.0
13.	Type of Scheme	Govt.	83	90.2
		Pvt.	9	9.8
14.	Behavior of Family	Positive	385	96.3
		Negative	15	3.8

Table-2: Distribution of the Type of Non Communicable Disease with Depressive Outcomes

		Level of depression			
Types of NCDs	n	No depression (n)	Mild depression (n)	Severe depression (n)	P -value
Diabetes Mellitus	132	92	34	6	0.004*
Hypertension	217	116	87	14	0.001*
Thyroid	28	12	10	6	2.45
Chronic Kidney Disease	6	4	2	0	0.843
Cardiac Conditions	42	12	18	12	0.004*
Respiratory disorder	41	26	11	4	3.245

Table-3: Descriptive Statistics of Nutritive Variables Among the Study Participates (n=400)

Variables	Mean, (SD)
Energy (Kcal)	1103.11,(240.24)
Carbohydrate (gm)	167.51,(42.08)
Protein (gm)	37.17 ,(19.36)
Fat (gm)	29.17 ,(18.65)
Beta carotene (mcg)	204.43 ,(439.51)
Vitamin C (mg)	26.05 ,(18.90)
Iron (mg)	8.42 ,(3.02)
Calcium (mg)	145.32 ,(116.40)
Zinc (mg)	7.98 ,(1.74)
Selenium (mcg)	25.12 ,(6.00)
Chromium (mcg)	33.15 ,(9.03)

Table-4: Association Between Depression and Nutritive Variables Among the Study Participates (n=400)

Nutrients		Depression					
		Present	Absent	Odds ratio	95% CI	Chi square, DF	P- value
Protein	Deficiency	131	96	1.287921	1.66-0.74	3.636,399	4.216
	Excess	89	84				
Vit A	Deficiency	125	103	0.916386	1.43-0.64	2.365,399	0.843
	Excess	98	74				
Vit C	Deficiency	79	103	3.633112	2.76-1.10	1.042,399	0.001*
	Excess	38	180				
Calcium	Deficiency	66	116	2.384236	2.29-0.92	0.942,399	0.004*
	Excess	42	176				
Iron	Deficiency	84	122	2.037471	2.14-0.86	1.184, 399	<0.001*
	Excess	49	145				
Zinc	Deficiency	130	90	1.292398	1.66-0.75	6.347,399	2.415
	Excess	95	85				
Selenium	Deficiency	114	98	0.444778	1.06-0.41	9.647,399	1.258
	Excess	136	52				
Chromium	Deficiency	112	80	0.397531	1.03-0.34	4.231,399	3.589
	Excess	162	46				

In this study population, the daily intake of carbohydrate, fat and protein was 61%, 14% and 25% respectively.

The results revealed compelling findings, particularly in relation to deficiencies in certain nutrients. Notably, deficiencies in Vitamin C, Calcium and Iron were significantly associated with the presence of depression, as evidenced by chi-square statistics of 1.042, 0.942, 1.184, respectively, with corresponding p-values of 0.001* (odds ratio=3.633, 95% CI=2.76-1.10), 0.004*(odds ratio=2.384, 95% CI=2.29-0.92), <0.001*(odds ratio=2.037, 95% CI=2.14-0.86).These outcomes suggest that individuals with deficiencies in these specific nutrients are more likely to experience depression compared to those with adequate levels. These findings emphasize the potential role of nutritional factors in mental health outcomes [Table 4].

The comprehensive analysis of demographic characteristics, nutritional intake and health-related factors in this study has provided a rich foundation for discussion, offering valuable insights into the intricacies of this study population's health and dietary habits. The demographic data revealed a diverse and representative sample of the population under investigation. Variations in gender, religion, location, education, employment status, living arrangements, and financial dependency reflect the heterogeneous nature of the study participants. These demographic factors play a pivotal role in shaping nutritional choices and health outcomes, underscoring the need for tailored public health interventions that consider the unique characteristics of different subpopulations.

The nutritional analysis unveiled important patterns in dietary habits among the study participants. From this present result, we have seen that the mean dietary intake of population cannot able to reach the recommended allowances. For this sake, population is running in the deficit category., on the other hand form the balance diet distribution the result has changed inexplicably. It might contradict to opt out the nutritional intervention of the population. Moreover, several studies revealed the obstacle to make up mind the recommendation protocol for the community because of the ambiguity the definition and value used in RDA or EAR[18].

The examination of Geriatric Depression Scale (GDS) scores in relation to nutritive elements revealed intriguing connections. Notably, significant associations were found between depression and vitamin C, iron and calcium intake. With regard to vitamin C, many experimental evidences demonstrate the potential beneficial roles of dietary vitamin C on depressive symptoms. According to Fraga impairment and depressive-like behavior[19], stress-induced anorexia and anxiety behaviour associated to social environments[20] can be quickly remedied with a single vitamin C dose. For the sake of dietary calcium intake, despite there are some limitations to collect evidence, ME Payne and associates found some connections between brain function and dietary calcium intake by discovering indications of a favourable relationship between the volume of brain lesions and calcium and vitamin D intakes among older adults with and without depression which support the hypothesis that calcium dysregulation and brain lesions are related[21]. Additionally, the effects of iron on brain function and mood presentation have been documented in several studies[22]. Many neurological processes include iron, and iron deficiency is linked to symptoms of depression and anxiety as well as developmental issues[23]. Hidese, suggest that inclusion of iron in daily diet can alter the risk of depression[24].A few studies have shown that consuming more iron might help reduce the likelihood of experiencing depressed symptoms[25]. A low iron level causes aberrant white matter myelination as well as changes in monoamine neurotransmitters[26]. Variations in the iron state of the brain affect glutamate and GABA homeostasis[27].Thus., iron consumption may lower the chance of mental problems, which might be explained by these potential biological processes. These changes result in emotional and psychological issues. Although having some positive association of depression with iron intake, there are a couple of studies opined their opposite thought regarding iron intake and psychiatric outcomes. Unlike Jung, Grønli and several other studies our observation cannot able to find any significant correlation with the dietary zinc intake and the psychological deformities[28]. Additionally, with regard to other nutrients, there are some limitations to mention experimental evidence of the notable effects of dietary consumption of nutrients on depressive outcomes. This underscores the importance of considering nutrition as a potential modifiable factor in mental well-being and warrants further exploration.

The study delved into specific diseases especially NCDs and their relationships with psychiatric outcomes. Casting a glance on recent report on Taneja. N and associates, it is revealed that owing to the presence of NCDs, 79.2% (46.2% mild, 43.7% moderate, 10.1% severe) of depression and 56.43% (45.6% mild, 45.6% moderate, 8.8% severe) of anxiety disorder were prevalent in East Delhi[29].These associations highlight the potential effects on the occurrence psychiatric outcomes and presence of NCDs by rising awareness on psychiatry as part of disease management and prevention strategies.

CONCLUSION

In summary, the study's findings provide a comprehensive picture of the interplay between demographics, dietary habits, mental health and specific diseases within the study population. These

insights serve as a valuable resource for public health initiatives, offering a foundation for tailored interventions that consider the diversity of the population and the potential role of nutrition in health outcomes. However, further research and interpretation are warranted to fully understand the implications of these associations and to develop evidence-based strategies for enhancing public health and well-being.

The study's comprehensive analysis of multiple tables encompassing demographic characteristics, nutritional intake, health conditions and their relationships has provided a multifaceted understanding of the study population. These findings contribute to our understanding of the potential dietary factors that influence mental well-being and disease management within the study population. While further research is necessary to fully grasp the implications of these associations, the study's results provide a valuable foundation for future investigations into the complex interplay of nutrition, demographics and complete health (physical and mental both) outcomes. By conducting this entire research, we found ambiguity in applying nutritive data collection protocol along with limitations of finding effects of micronutrients on psychiatric outcomes owing to scarcity of valid evidences. Last but not the least, the reluctance of study participants to provide information along with showing their impatience was notable findings in this study which might be considered.

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