



RESEARCH ARTICLE

ASSESSMENT OF NUTRIENT INTAKE AND PHYSICAL ACTIVITY PATTERN IN VEGETARIAN GERIATRIC POPULATION, AGED 60-70 YEARS

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Abstract

Several changes have been seen in eating behavior which creates an impact on the palatability, food choice, social features, and psychological factors of the person which lowers the recommended dietary intake/daily requirements. Objectives: The purpose of this study was to examine the association between the nutrient intake and physical activity and also to assess dietary habits along with medical conditions in geriatric population aged 60-70 years. Methods: This purposive analysis included 100 samples of both male (n=55) and female (n= 45) gender. The dietary habits and nutrient intake of all participants were assessed using a food frequency questionnaire (FFQ) and 24-hour dietary recall. The cognitive and physical function was evaluated using The Lawton Instrumental Activities of Daily Living Scale (Lawton IADL Scale), chair test and history of medical conditions were accumulated using online and telephonic mode. Results: The evaluation of nutrient intake was found to have a significant correlation with physical exercise of the active participants (n=77) which included dairy products (p=0.05), green leafy vegetables (p=0.024), other vegetables (p=0.022), root vegetables (p=0.018), fruits (p=0.047) and sugar (p=0.003). In addition, the eating habits were observed to have a notable association with medical history of the subjects, that exhibits gastrointestinal problems, cardiovascular risk, diabetes, thyroid and asthma to be considerably linked with the eating pattern. However, the optimum daily requirement of nutrients (energy, protein, calcium and vitamin C) was determined to be inadequate. Conclusion: Recommended dietary requirements can be beneficial in performing physical exercises to diminish the risk of frailty and the risk of comorbidities by comprehending certain daily physical activities. These findings further reward the advantages of adopting an active lifestyle.

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Introduction:-

India, the second most populous country in the world, is experiencing the changes in people above 60 years and more rising with a rate of 7.5% in 2010 to 11.1% in 2025 [www.ncbi.nlm.nih.gov] which will bring exceptional changes and burden of mortality and morbidity across the developing countries. According to WHO the increasing rate of elderly population in 2019 was 1 billion which will take a turn of 1.4 billion by 2030 and 2.1 billion by 2050. [<https://www.who.int>]

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The major changes seen in elderly people are changes in eating behavior which creates an impact on the palatability, food choice, social features, as well as psychological factors of the person leading to anorexia that lowers the recommended dietary intake/daily requirements. A cross-sectional observational study regulated on community dwelling elderly subjects with senile anorexia assessed the change in eating habits developed. A total number of 526 random samples among which 217 free living individuals, 213 residents in nursing homes and 93 patients in rehabilitation and acute wards, with age 65 years and older went through several evaluations consisting of anthropometric measurements, nutritional status, depression, taste, swallowing functions and few hormones related to appetite along with assessing the frequency of few other food groups. The assessment resulted in the reduction of food intake and lower consumption of certain food groups like, meat, egg, fish, fruits and vegetables. [Donini et al., 2013]

It was observed that the loss of motor neuron and muscle fiber occurring during ageing can never be replaced, but the structure and function of cardiorespiratory, musculoskeletal and metabolic systems are susceptible to enhance by training or exercise, because it has been calculated that decline of physiological functions and systems after the age of 40 is linked with anatomical and ultrastructural changes. [McPhee et al., 2016]

Geriatric populations, being a vulnerable age group, can be seen dealing with high risk of deficiencies and metabolic changes. Micronutrient and macronutrient deficiencies are common leading to several deficiency signs and symptoms. A cross-sectional analysis when assessed using the sociodemographic profile and dietary intake of nutrients showed that Indians of older age irregularly consumed the essential micronutrients, possibly due to poor quality and quantity of food. A higher rate of geriatric population did not consume the daily recommended intake of several food groups such as pulses, green leafy vegetables, other vegetables and milk products. [Gupta et al., 2017]. Involvement of educational programs including nutritional education are necessary to create awareness about improved, healthy, positive and therapeutic change in life-style to boost knowledge about osteoporosis, fall self-efficacy, and also enhance the intake of calcium and vitamin D rich foods especially in community dwelling housing elderly population. [Park et al., 2017]

Achieving physical activity is the protective measure and is in addition to resistance training as well as an effective and common intervention for older adults in reducing the risk of frailty scores and increases muscle strength and mobility with frailty symptoms. [Nagayi et al., 2018]. Being physically active is associated with better general health and fewer health imbalances. Diet quality and physical activity are linked with Health-related quality of life (HRQOL) in building common, healthy and active lifestyles. [Xu et al., 2018]

Review Of Literature:-

Nutrition and Exercise enhance the quality of life:

A study that investigated the absolute intake of protein sources by older men determined the measures of muscle size and strength, body composition, resting energy expenditure (REE) and skeletal muscle creatinine concentrations in return of a resistive training of 12 weeks. 21 men of age 65 ± 5 years were randomly selected and were asked to consume a lacto ovo-vegetarian diet (LOV) for 2 weeks and later were demanded to consume a beef containing (BC) diet (n=10) or to continue a lacto ovo-vegetarian diet (LOV) (n=11), throughout resistive training. The BC diet gave 0.6g of protein/kg/day from beef while LOV gave 0.6g of protein/kg/day from the soy protein sources. The rest protein came from the self-selected sources of LOV. This consumption of BC and LOV diet resulted in the gain in maximal dynamic strength upto 14-38% with the mean ranging from 1.03 to 1.17 g/kg/day, and recorded no marked difference between both the groups in regards to body composition, REE and concentrations of muscle creatine, phosphocreatine and total creatine. [Haub et al., 2002]

A review aimed at knowing the percentage of obstacles faced while performing physical activity included 132 qualitative studies and a total number of 5987 subjects of age 60 years and above. Several medical and pharmacological programs such as MEDLINE, EMBASE, AMED and PsychINFO were read to analyze the data involving themes like; physical limitations, personal benefits of physical activity, social influences, competing priorities, assess difficulties and motivation and beliefs. Although being physically active in older age have been identified as requisite for lowering the risk of several diseases, this report concluded that few fell for this as an unnecessary and possibly harmful task while others believed in its benefits when anticipated. [Franco et al., 2015]

A similar review was carried out in the same year focused on the utilization of protein sources among 1279 elderly participants (219 institutionalized elderly, 312 frail and 739 as community dwelling) using a 2-3 days dietary recall.

The composed report presented that the consumption of protein was majorly from animal sources (meat) and dairy products (60%) while the consumption of plant sources for institutionalized were 29%, 37% in frail and 40% in community dwelling population accounting for 58 ± 16 g/day, 71 ± 20 g/day and 71 ± 18 g/day respectively as the daily protein intake. However, the use of animal protein was more than 60% than plant sources, showing only 40% of the total consumption. [Tieland et al.,2015]

Nutritional and physical intervention for risk of frailty:

Frailty being a declining condition and the most challenging phase in ageing was studied to identify its risk in elderly population consisting of 166 high frailty risk and 171 low frailty risk women (aged 65-90 years). The analysis of several mobility performance tests which included 5-chair sit-to-stand (STS), alternate step, timed up-and-go (TUG), timed rapid gait (TRG) and usual gait speed (UGS) conducted illustrated highest sensitivity (78%) and specificity (83%) for the TRG test whereas, low frailty risk participants (55.0%) were less likely to be pre-frail than high frailty risk individuals (81.9%) suggesting the clinical assessment by walking ability test in identifying the risk. [Kim et al.,2010]

A significant study carried out in the year 2016 declared that improvements in quality of life was due to involvement of physical activity among 21 male and 80 female participants aged 66.4 ± 6.3 years, sedentary and minimally active geriatric population. The assessment of habitual practise of physical activities via International Physical Activity Questionnaire (IPAQ) and quality of life using WHOQOL-BREF questionnaire respectively proclaimed that QOL scores; physical health ($p=0.027$), psychological health ($p=0.000$), social relationships ($p=0.005$) and environment ($p=0.000$) were higher in the group with highest physical activity. [Kusumaratna et al.,2016]

Nutrition and physical activity in prevention of diseases:

Antioxidant-rich fruits and vegetables have been shown to be correlating with neurological disorders and oxidative stress. Similarly, an engaging cross-sectional study was supervised with 278 elderly participants ($n=144$ with depression and $n=134$ without depression) to assess the relationship between the intake of antioxidants and clinically diagnosed depression in the 60 years and older population. The food frequency questionnaire directed in 1999-2007 found that primary sources of antioxidants (fruits, vegetables, vitamin C, lutein and beta cryptoxanthin) were fairly lower than the recommended levels in depressed participants as compared to others without depression ($p < 0.05$). The data partly emphasized on the risk of cardiovascular disease among older aged people with depression also focused on the effect of antioxidants food sources. [Payne et al.,2012]

Methodology:-

Background data:

The selection of samples was done on the basis of general demographic attributes including age, gender, income, education, employment among both males and females from various socio-economic environments through online mode. The population was designed to be vegetarian, since the sources of plant protein available for the vegetarian community are not high biological value protein as compared to other animal protein sources; thus, to clear the prevalence of frailty among the subjects, their dietary and eating habits were also examined.

Sampling Area And Selection:

The study was conducted in a few selected cities of Indian States; Madhya Pradesh and Uttar Pradesh. Being a part of Central and Northern India, the diversity in inhabitants made it accessible to gather various types of samples, both male and female vegetarian community through Purposive Convenience Sampling method. Subjects falling under the 60-70 age group in which 55 males and 45 females participated from several demographic areas were selected by a purposive convenience sampling method.

Tools For Data Collection:

The economic and social position of the participants was evaluated using the Kuppaswamy Socioeconomic scale (modified 2019). Participants's anthropometric measurements were evaluated to interpret the body mass index (BMI) subsequently. Each subject's health history was aggregated, since medical or health history plays an important role in providing relevant information bearing on their past or present.

Dietary Behaviour - The dietary pattern of the subjects was assessed using the Food Frequency Questionnaire (FFQ) depending upon the criteria given by Food and Nutrition Technical Assistance III Project (FANTA) consisting of several food groups. The FFQ was to respond on the following attributes: Once a day, two times a day, four-five

times a week, two-three times a week, zero-one time a week, two-three times a month, once a month and never. The participants were also asked to recall all the foods and drinks consumed by them on the previous day for the 24-hour dietary recall. To clarify the consumption of macronutrients and micronutrients, participant's eating habits were assessed based on the Indian Food Composition Table (IFCT) by National Institute of Nutrition (NIN), Indian Council of Medical Research (ICMR) specifically for protein, calcium and vitamin C. Besides, were asked to answer the query correlating the eating pattern that included the number of meals, snacks consumed in a day along with sweets, salt, food allergies, etc. Sugar and roots and tubers as an additional food group were combined along with other food groups.

Subject's frailty index was assessed using the Lawton Instrumental Activities of Daily Living Scale (IADL), which focused on the geriatric physical examination.

Results And Discussion:-

Table 1:- Exercise performed by the subjects.

Exercise	Percent
Yes	77.0
No	23.0
Total	100.0

The above table 1 displays 77% of subjects performing some kind of physical activity while 23% had a sedentary lifestyle. Living a physically active life has been associated with reduced and declining incidences of frailty. Exercise can help decrease muscle inflammation, increase muscle protein synthesis and increase anabolism thereby preventing the extent of frailty in elderly population. A similar review in 2015 concluded that daily physical activity has been associated with reduced risk of physical disability and also extends the longevity. Besides, it can be an efficient method to prevent and treat frailty that targets certain criteria: low physical activity, weakness, poor exercise tolerance and slowed motor performance (Aguirre and Villareal 2015).

Table 2:- Distribution of daily activities of the subjects.

Daily Activity	Percent
Low	20.0
Middle	28.0
High	52.0
Total	100.0

The daily activity of participants was calculated by Lawton Scale of Daily activities which reflected high physical activity (performed cognitive and executive functions) in more than half of the population (52%) followed by others who were not engaged in IADL activities like household chores, grocery shopping, preparing food, handling finances even though they were fully capable of doing it.

Table 3:- Comparison of cereal intake with exercise.

	Perform Exercise	N	Mean $\pm$ Standard Deviation	t-value	df	Sig.
Cereals	Yes	77	23.77 $\pm$ 12.77	1.848	98	0.068
	No	23	18.39 $\pm$ 10.15			

It was noticeable that wheat was the most frequently consumed cereal; 80% of the subjects consumed wheat 2 times a day, only 48% of subjects consumed rice once a day followed by 2-3 times a week by 22% of subjects. However, oats, bajra and jowar were moderately consumed by the population. Table 3 depicts the correlation of cereal intake with respect to exercise, which pointed out no significance ($p = 0.068$) with physical activity.

A significant study conducted for 11 years found that Ready-to-eat cereal (RTEC) was preferred more by participants in order to get various micronutrients including folate, vitamin B complex which can fulfill the desired requirement along with being a nutrient dense, quick, easy to cook and cost-effective method. However, with long run people with RTEC were found to have lower cognitive function when compared to those with regular intake of cereal (Wengreen et al.,2011)

Table 4:- Comparison of leafy vegetable intake with exercise performance.

	Perform	N	Mean $\pm$ Standard	t-value	df	Sig.
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	Exercise		Deviation			
Leafy Vegetable	Yes	77	34.66 ± 21.75	2.28	98	0.02
	No	23	23.22 ± 18.56			

It is evident that intake of leafy vegetables was infrequent among the subjects. Only 27% of subjects consumed cabbage 2-3 times a month along with spinach, fenugreek leaves, mustard leaves and cauliflower. The other leafy vegetables were rarely consumed by the participants. Significant relation ($p = 0.024$) between leafy vegetable consumption and exercise performance was found in table 4. Subjects who performed physical exercise have been observed to consume more leafy vegetables.

Table 5:- Comparison of fruit intake with exercise performance.

	Perform Exercise	N	Mean ± Standard Deviation	t-value	df	Sig.
Fruits	Yes	77	45.53 ± 24.57	2.010	98	0.047
	No	23	33.70 ± 25.51			

The frequency of fruit consumption studied showed the most consumed fruits were citrus fruits; guava, lemon and orange. Though other fruits such as plum, blackberry, banana, papaya and mango(ripe) were moderately consumed, twice or thrice a month. Even though the intake of fruits shown in table 5, showed a positive correlation with exercise of participants ($p = 0.047$) in the study.

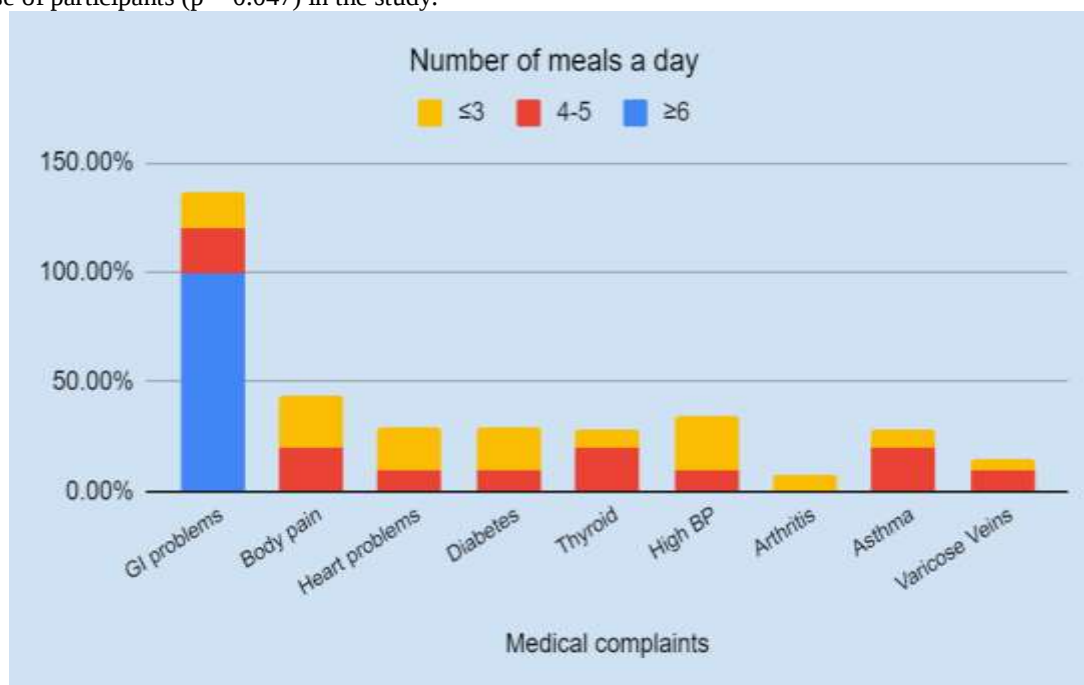


Figure 1:- Comparison of medical problems of subjects with number of meals consumed.

The above figure shows the correlation of the number of meals per day with medical conditions faced by the subjects. It is evident from the graph that subjects who consumed more than equal to six meals a day were found to have Gastro-intestinal problems the most. However, hardly any percent (16.20%) of subjects showed problems when the meal was reduced to less than equal to three. With regard to body pain, heart problems and diabetes, the change in the number of meals from less than equal to three and four to five meals per day found no major correlation. Although thyroid, hypertension, asthma and varicose veins were identified as conditions influenced by the number of meals per day. The odds of developing thyroid was 8.10% for less than three meals per day followed by hypertension (24.30%), asthma (8.10%) and varicose veins (5.40%).

Summary And Conclusion:-

The present study showed that regular exercise and daily activity performance was highly associated with the increased consumption of various food groups. However, participants who lived a sedentary lifestyle were not found to have any correlation with the consumption of various nutrients. Frailty assessment showed that the problems

faced by participants while standing up from a chair and time taken to stand from a chair were associated with sedentary lifestyle. On the other hand, Lawton Instrumental Activities of Daily Living Scale (IADL) was identified to be linked with high cognitive function. The consumption of cereals, pulses and nuts, and oilseeds was not significantly related to the physical activity of the participants whereas, other food groups such as dairy products, green leafy vegetable, other vegetable, roots and tubers, fruits, and sugar consumption was seen to positively influence the exercise performance of the active participants. Evaluation of macro and micronutrients; the requirement for protein was not fulfilled by the subjects according to the standard requirement given by RDA. The levels of vitamin C and calcium intake were also seen to be lower than the recommended intake. Irrespective of the reduced energy and other nutrients intake, there was no correlation found in the physical activity performance.

Thus, it can be concluded that adequate consumption of fruits, vegetables, and dairy products can be beneficial in delaying the onset of frailty in elderly population and also improves the performance of physical activity, reducing the risk of comorbidities by comprehending certain daily physical activities.

Recommendation:-

The collection of data can be done using a 3-day dietary recall for more accurate results.

Monitoring physical activity and frailty of the participants can be done using more scales such as, Edmonton Frail Scale (EFS), Tilburg Frailty Indicator (TFI), and Physical Activity Scale for the Elderly (PASE) which will help generalize more relatable results.

The present study lacks inclusion of animal protein, which is complementary to the health of elderly and can be beneficial in future analysis.

Correlation between physical exercise and Lawton Daily Activity Scale can be done to evaluate accurate results on the active participants.

Limitations:

The data collected is solely based on the age group 60-70 years residing in Central and Northern India.

Considering the pandemic situation, the data could not be collected via personal interview method thus, an online questionnaire prepared on Google form was circulated.

The online form was only able to collect answers to FFQ, so 24-hour dietary recall was generated only by 20% of the participants.

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