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Research Article

Lifestyle Modifications Can Suppress Non-Communicable Diseases in the Iranian Men Elderly

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Abstract

Background and Purpose: Aging is the predominant risk factor for most diseases and situations that restrict the health span. The aim of this study was to investigate of association between physical activity levels and nutritional status with various diseases and the use of medications. .

Material and Method: This is a cross-sectional study was conducted in Tehran in 2019 with 422 Community-dwelling elderly men who participated, voluntarily. Health condition, level of physical activity, and nutritional status were measured using medical history, PASE, and MNA questionnaires, respectively..

Results: There was a significant negative relationship between physical activity with cardiovascular diseases ($p < 0.04$) and comorbidity ($p < 0.034$). Besides, MNA score was significantly negatively correlated with cardiovascular diseases ($p < 0.029$), liver diseases ($p < 0.000$), chronic kidney diseases ($p < 0.015$), comorbidity ($p < 0.000$), fat-lowering drugs ($p < 0.001$), and multiple medication ($p < 0.017$).

Conclusion: The results of this study indicated that the level of physical activity and food dietary can be used as safe and cost-effective solutions to prevent various diseases and polypharmacy in the elderly.

Keywords: *Diet; Exercise; Aging; Diseases; T2DM; Pharmacy; Physical Activity*

Introduction

Aging is defined by a progressive degeneration of the tissues that have a negative impact on the structure and function of vital organs [1]. The rate of national communities over age 65 has been growing in the last 10 years and will remain to rise for another 20 years due to enhanced life expectancies and a post-World War 2 baby boom. Beginning in 2030, the numbers of adults over age 85 will grow quickly. By 2050, the number of adults over age 80 nearby the globe will triple from 2015 numbers [2]. It has published the latest general census in Iran revealed that 7.27% of 75 million population of Iran are older than 60. Population predictions pointed that this rate would reach 10% over 25 years and 25% in 2050 [3].

Aging is the predominant risk factor for most diseases and situations that restrict the health span [4,5]. Loss of physiological integrity, resulting in a gradual decline of homeostasis and diminished capability to respond to environmental inducements with age, contributes to

an incremental risk of morbidity and mortality [6,7]. Chronic non-communicable diseases (NCDs) are the head reason for death, accounting for 70% of global mortality. Additionally, referred to as chronic diseases, NCDs mainly include cardiovascular disease (such as heart disease and stroke), cancer, chronic respiratory disease, dyslipidemia, diabetes, liver diseases, and arthritis [8]. Furthermore, almost 80% of NCD deaths occur in low and middle-income countries [9]. Further, based on WHO predicting, NCDs death will rise by 17% over the next ten years [9]. Daily, 800 to 850 deaths happens in Iran which 89% of them are relevant to five principal causes: Cardiovascular disease (46%), accidents (17%), cancer (14%), respiratory diseases (6%), and disease around the time of birth (6%) [10,11].

Physical inactivity was found to be connected with an expansion in the existence of NCDs; hence, physical inactivity contributes to deaths and weaknesses [12-18]. In particular, physical inactivity has influential impacts on the appearance of coronary heart disease, type 2 diabetes, and cancer, specifically breast and colon cancers [19]. Besides, prior investigations have explicated, Low level of physical activity is one of the foremost risk factors for non-communicable diseases (NCDs) such as cardiovascular disease and type 2 diabetes [20]. Also, it is responsible for 2.4 billion dollars health-care costs in the Eastern Mediterranean regions, with Iran's share estimated at 609,296 dollars [21].

It has well established that with growing age Malnutrition and unintentional weight loss contribute to continuous deterioration in health, diminished physical and cognitive functional situation, enhanced utilization of health care services, premature institutionalization, and increased mortality [22,23]. Moreover, decrease in cardiac muscle mass is recognized in malnourished individuals. The resulting reduction in cardiac output has a corresponding impact on renal function by decreasing renal perfusion and glomerular filtration rate [24]. Moreover, a considerable number of studies have subsequently supported this original observation. Malnourished surgical patients have complications and mortality rates three to four times higher than normally nourished patients, with longer hospital admissions, incurring up to 50% greater costs [25].

In our previous studies, we have reported the role of physical activity and proper diet in preventing diverse diseases and related risk factors [5,26-28]. Regarding the above mentions, rising elderly population, medical cost, and related non-communicable diseases, it's necessary to find a cost-effective and safe approach to prevent the mentioned diseases and related complications. Therefore, the purpose of this study was to investigate of association between physical activity levels and nutritional status with various diseases and the use of medications.

Methods

Subjects and study design

This is a cross-sectional study was conducted in Tehran in 2019 with 441 Community-dwelling elderly men who participated, voluntarily. At first, they were given a detailed explanation regarding the study's purpose and methods. Then, all of the subjects signed informed consent forms and were provided exhaustive information considering the study purpose and process. Iranian elderly had to meet the following inclusion criteria: aged 60-90, living in Tehran, living independently, ability to interview, and self-governing walking. Exclusion criteria were, orthopedic abnormalities and walk with assistance, current or recent fractures, use of medications that could affect muscle strength and balance, having an acute illness, cognitive impairments, and neurological problems such as Parkinson disease and stroke. After the evaluating of inclusion and exclusion criteria, 19 elderly excluded and Finally 422 subjects participated.

Medical history assessment

To evaluating demographic conditions and health and disease history we used medical history questionnaire. It was a researcher-made questionnaire that consists of two parts as demographic and medical parts. Demographic characteristics included age, educational level,

marital status, residency, birthplace, job status, and the number of children. The medical part includes comprehensive information about disease history and using medications.

Physical activity assessment

Considering different intensity, frequency, duration, and types of physical activities among the elderly, a structured questionnaire that is inclusive of specific activity types for the elderly is suitable for epidemiologic surveys. In this study, we used the Physical Activity Scale for the Elderly (PASE) questionnaire for measuring the participants' general activity level. It was originally designed to measure the quantity and quality of physical activity among community-dwelling elderly people. The higher total PASE score indicates higher levels of physical activity. The validity and reliability of the questionnaire in the Iranian population have been confirmed with Cronbach alpha 0.97% [29]. PASE scores were categorized as sedentary (< 40), light physical activity (> 41; < 90) and moderate to intense activity (> 90).

Nutritional status assessment

The MNA is a validated instrument initially developed to assess nutritional status in elderly patients and is mainly indicated for research settings. The tool contains 18 items and evaluates 4 different aspects: anthropometric assessment (body mass index (BMI), weight loss, and arm and calf circumferences). The MNA is a simple, low-cost, non-invasive method that can be performed at the bedside. It is a useful screening tool for diagnosing malnutrition and the risk of malnutrition in the elderly. In this study after the screening of nutritional status, subjects divided two groups (well-nourished and poor-nourished) based on cut-off value (score 12) [30].

Statistical analysis

The collected data were analyzed in SPSS 21 at a significant level of $P < 0.05$. We used the Kolmogorov Smirnov test, for normality of data distribution. Descriptive analysis for socio-demographic variables was performed using frequencies (n), percentage (%), and mean Sd. The Pearson and Spearman correlation coefficient test was used to determine the relationship between parametric and non-parametric variables. An independent t-test was used to compare between different groups.

Results

The sample contained 422 elderly men aged between 60 and 90 years old and the majority of them aged between 60 - 70. The mean BMI was 27.17 ± 3.32 kg/m^2. The most prevalent chronic diseases were hypertension 183 (43%), cardiovascular diseases 141 (33.49%), and Arthritis 138 (33%). Only 79 (18.20%) subjects reported no diseases. Also, about one-third of the population consumed fat-lowering drugs and 39% used drugs to control blood pressure. But Just 23% of subjects reported taking glucose-lowering drugs (Table 1).

The results of correlations showed that there was a significant negative relationship between physical activity with cardiovascular diseases ($p < 0.04$) and comorbidity ($p < 0.034$). Besides, MNA score was significantly negatively correlated with cardiovascular diseases ($p < 0.029$), liver diseases ($p < 0.000$), chronic kidney diseases ($p < 0.015$), comorbidity ($p < 0.000$), fat-lowering drugs ($p < 0.001$), and multiple medication ($p < 0.017$). On the other term, there was a positive significant relationship between BMI with hypertension ($p < 0.017$), arthritis ($p < 0.000$), comorbidity ($p < 0.004$), blood pressure-lowering drug ($p < 0.006$), and multiple medication ($p < 0.006$). Also, WHR was significantly positively correlated with type 2 diabetes mellitus ($p < 0.001$), comorbidity ($p < 0.028$), fat-lowering drugs ($p < 0.008$), and glucose-lowering drugs ($p < 0.008$). Moreover, educational status was significantly negatively correlated with comorbidity ($p < 0.012$) and multiple medications ($p < 0.011$) (Table 2).

Variables		Mean ± SD	N (%)
Age (years)	60 - 70	71.81 ± 6.23	243 (57.31%)
	71 - 80		136 (32.08%)
	81 - 90		45 (10.61%)
Height (cm)		170.21 ± 5.61	
Weight (kg)		77.83 ± 10.35	
BMI (kg/m^2)		27.17 ± 3.52	
WHR		0.931 ± 0.068	
PASE score		94.26 ± 65.51	
Educational status	Not literate		28 (6.67%)
	Primary school		177 (42.13%)
	Middle school/ diploma		102 (24.29%)
	Bachelor		96 (22.86%)
	Master/PHD		17 (4.05%)
Diseases	Hypertension		179 (42.22%)
	CVD		141 (33.25%)
	Arthritis		138 (32.55%)
	T2DM		108 (25.47%)
	CDK		51 (12.03%)
	LD		25 (5.90%)
Medications	BP-lowering drug		165 (38.55%)
	Fat--lowering drug		133 (31.07%)
	Glucose-lowering drug		100 (23.36%)
	Other Drug		86 (20.09%)

Table 1: *Demographic, physiologic and diseases and medication use data of elderly.*

BMI: Body Mass Index; CVD: Cardiovascular Disease; T2DM: Type 2 Diabetes Mellitus; CDK: Chronic Kidney Diseases; LD: Liver Diseases; BP: Blood Pressure.

As you indicated in table 3, the elderly divided three groups (low, moderate, and high level of physical activity) to compare various non-communicable diseases, comorbidity, and multiple medications. Then, the results of ANOVA showed that there was a significant difference between moderate and high levels of physical activity in terms of cardiovascular disease ($p < 0.004$) and comorbidity ($p < 0.035$). Besides, there was a significant difference between low and moderate levels of physical activity in terms of chronic kidney diseases ($p < 0.010$).

The results of the independent T-test showed that the mean of liver diseases ($p < 0.035$) and comorbidity ($p < 0.035$) was significantly higher in poor-nourished than well-nourished (Table 4).

		Age	Edu.	WHR	BMI	MNA score	Physical activity
Hypertension	R	.029	-.092	.036	.116*	-.074	-.062
	P	.545	.062	.470	.017	.127	.204
T2DM	R	.035	-.084	.169**	.044	-.093	-.041
	P	.469	.087	.001	.364	.057	.399
CVD	R	.085	-.077	-.008	.018	-.106*	-.138**
	P	.080	.117	.876	.713	.029	.004
Liver Disease	R	-.074	.102*	.051	-.015	-.188**	.023
	P	.128	.038	.295	.752	.000	.641
CDK	R	-.035	-.063	.030	.076	-.118*	-.027
	P	.477	.198	.536	.117	.015	.581
Arthritis	R	.002	-.036	.075	.184**	-.052	-.089
	P	.975	.461	.129	.000	.290	.067
Other Disease	R	.134**	-.070	.037	.030	-.122*	-.003
	P	.005	.157	.451	.543	.012	.944
Comorbidity	R	.066	-.123*	.107*	.141**	.217**	-.100*
	P	.173	.012	.028	.004	.000	.038
BP-lowering drug	R	.056	-.058	.023	.134**	-.065	-.069
	P	.249	.239	.633	.006	.182	.155
Fat--lowering drug	R	-.010	-.084	.129**	.083	-.159**	-.069
	P	.831	.086	.008	.088	.001	.155
Glucose-lowering drug	R	.041	-.060	.130**	.031	-.057	-.073
	P	.395	.225	.008	.395	.240	.136
Multiple medications	R	.030	-.124*	.094	.133**	-.116*	-.043
	P	.534	.011	.055	.006	.017	.374

Table 2: *The correlation between anthropometric, physical activity and nutritional status with non-communicable diseases and medications use.*

BMI: Body Mass Index; Edu: Educational Status; CVD: Cardiovascular Disease; T2DM: Type 2 Diabetes Mellitus; CDK: Chronic Kidney Diseases; LD: Liver Diseases; BP: Blood Pressure.

**: Correlation is significant at the 0.05 level (2-tailed).*

***: Correlation is significant at the 0.01 level (2-tailed).*

	Dependent variables	SS	MS	F	P			P
Level of Physical activity	Hypertension	0.552	0.276	1.125	0.326	High	Moderate	0.300
							Low	0.740
						Moderate	High	0.300
							Low	0.833
						Low	High	0.740
							Moderate	0.833
	T2DM	0.230	0.115	0.602	0.548	High	Moderate	0.863
							Low	0.286
						Moderate	High	0.863
							Low	0.397
						Low	High	0.286
							Moderate	0.397
	CVD	2.44	1.22	5.577	0.004	High	Moderate	0.003**
							Low	0.291
						Moderate	High	0.003**
							Low	0.346
						Low	High	0.291
							Moderate	0.346
	Liver Disease	0.096	0.044	0.937	0.393	High	Moderate	0.838
							Low	0.279
						Moderate	High	0.838
							Low	0.648
						Low	High	0.279
							Moderate	0.648
	CDK	0.966	0.483	4.91	0.008	High	Moderate	0.075
							Low	0.525
						Moderate	High	0.075
							Low	0.010*
						Low	High	0.525
							Moderate	0.010*
	Arthritis	0.570	0.285	1.304	0.273	High	Moderate	0.360
							Low	0.398
						Moderate	High	0.360
							Low	0.999
						Low	High	0.398
							Moderate	0.999
	other	0.026	0.013	0.041	0.960	High	Moderate	0.952
							Low	0.812
						Moderate	High	0.952
							Low	0.786
						Low	High	0.812
							Moderate	0.786
	Comorbidity	13.824	6.912	3.367	0.035	High	Moderate	0.011*
							Low	0.527
						Moderate	High	0.011*
							Low	0.109
						Low	High	0.527
							Moderate	0.109
	Multiple medication	1.488	0.744	0.614	0.542	High	Moderate	0.276
							Low	0.551
						Moderate	High	0.276
							Low	0.708
						Low	High	0.551
							Moderate	0.708

Table 3: *ANOVA results of physical activity levels regarding the Non-communicable diseases and Multiple medication.*

BMI: Body Mass Index; PA: Physical Activity; MNA: Mini Nutritional Assessment; CVD: Cardiovascular Disease; T2DM: Type 2 Diabetes Mellitus; CDK: Chronic Kidney Diseases; LD: Liver Diseases.

**: The mean difference is significant at the 0.05 level. **: The mean difference is significant at the 0.01 level.*

Variables	MNA < 12 (188)	MNA ≥ 12 (234)	P value
Hypertension	0.47 ± 0.5	0.39 ± 0.489	0.123
T2DM	0.29 ± 0.456	0.23 ± 0.422	0.154
CVD	0.38 ± 0.487	0.30 ± 0.459	0.072
LD	0.08 ± 0.272	0.03 ± 0.182	0.049*
CDK	0.14 ± 0.346	0.09 ± 0.286	0.123
Arthritis	0.36 ± 0.482	0.29 ± 0.453	0.102
Other	0.49 ± 0.598	0.38 ± 0.530	0.061
Comorbidity	2.19 ± 1.573	1.68 ± 1.291	0.000**
Multiple medication	1.24 ± 1.133	1.04 ± 1.072	0.070

Table 4: *The differences between well-nourished with at-risk and malnourished elderly.*

**: Correlation is significant at the 0.05 level (2-tailed).*

***: Correlation is significant at the 0.01 level (2-tailed).*

Discussion

With the increasing aging population, the main cause of death changes from infection to chronic non-communicable diseases [31]. It has been well proven that these diseases are also associated with heavy health and care costs [21]. As a result, the study of disease-related factors in the elderly has great importance to improve the level of health of society.

Education

In the present study, an inverse and significant relationship was observed between the level of education with Comorbidity (P < 0.012) and multiple medication (P < 0.011). Education plays an important role in individual health status [32]. In this regard, various studies have reported that a higher level of education is associated with a reduced risk of premature death and in fact, it plays a protective role in the health of the elderly [33,34]. Taylor., *et al*. (2010) reported that elderly people with higher levels of education generally have better mobility capability due to increased levels of physical activity and healthy behaviors and this issue facilitates daily tasks such as walking, personal work, and the like these [35] which indirectly reduces the risk of developing chronic diseases. Two hypotheses of budget constraint and efficiency improvement have been proposed as possible mechanisms for the effect of education level on reducing the incidence of diseases and increasing the health rate [36]. According to the budget constraint hypothesis, increasing the level of education is associated with individual higher income, and this issue leads to increase access of these people to health-related resources such as better jobs, better facilities and services, as well as better health insurance, and thus reduces the risk of these diseases. On the other term, the efficiency improvement hypothesis states that the individual with higher levels of education find gradually more aware of health-related issues and this subject is associated with an increase in healthy behaviors (Proper diet and physical activity) which these cases independently reduces the risk of various diseases [36].

Studies also show that many people with increasing age and for various reasons, including lack of awareness turns to different pills consumption [37]. Since multiple medications lead to various complications and increase the risk of premature death, then increase the level of education by enhancing the level of awareness can have protective effects on the health of the elderly people with reduce the incidence of diseases and pills consumption [38]. Moreover, the results of our research indicated that the risk of developing chronic non-communicable diseases decreases with the increasing level of education, which naturally the multiple medication often occurs less in these people.

Obesity-related anthropometric indices

In the present study, a positive and significant relationship between WHR and comorbidity ($P < 0.028$) was observed. Also, a positive and significant relationship between BMI with blood pressure ($P < 0.017$), comorbidity ($P < 0.004$), and multiple medication ($P < 0.006$) was observed. It has been well proven that increasing BMI and WHR is recognized as important risk factors for the occurrence and development of chronic diseases, especially in the elderly period [39,40]. High BMI and WHR, which are reflecting central obesity leads to increase the risk of various diseases through different mechanisms. The results of a study in 52 countries showed that high BMI independently increased the risk of cardiovascular disease, including myocardial infarction [41]. The results of studies in this field have indicated that the increase in BMI and WHR is generally associated with impaired secretion of hormones related to fat metabolism such as adiponectin and leptin, which causes to disrupt in fat homeostasis, increase the inflammatory factors, and ultimately leads to the incidence of various diseases such as cardiovascular and metabolic diseases [42]. On the other hand, increased central obesity has a close relationship with glucose metabolism and thereby increases the risk of diabetes [43]. Since diabetes is independently associated with many other diseases, it can lead to increase the comorbidity. In the present research, a positive and significant relationship between BMI and arthritis ($P < 0.001$) was observed. Several studies support our findings in this area [44,45], while many studies do not show such results [46,47]. It should be noted that obesity firstly directly (Increases of the inflammatory factors) and secondly by affecting biomechanical factors leads to longer moment arm about the center of gravity at the knee than at the hip or ankle during many activities, and also leads to the occurrence and development of Osteoporosis [48]. This issue leads to extra load tolerance, especially on joints that play a greater role in weight-bearing, such as the knees and ankles, and the incidence of Osteoporosis.

Nutritional status

In the present study, an inverse and significant relationship between malnutrition and cardiovascular disease ($P < 0.029$), liver disease ($P < 0.000$), kidney disease ($P < 0.007$), comorbidity ($P < 0.000$), and multiple medication ($P < 0.017$) was observed. Also, Comorbidity in the Well-nourished group was significantly lower than the Poor-Nourished group ($P < 000$). Studies have shown that malnutrition has a positive and strong relationship with elderly mortality [49]. It has been well established that malnutrition with increasing the inflammatory factors such as C-reactive protein and Intracellular adhesion molecule 1 (ICAM1) leads to an increase in the risk of cardiovascular disease [50]. On the other hand, malnutrition is associated with increased muscle wasting in the elderly period and leads to a decrease in the circumference of the arm and leg (As the risk factors for cardiovascular disease in elderly period) [51,52]. Available evidence shows that increased the fruits and vegetables consumption leads to a reduce the risk of cardiovascular events in the elderly people and this issue is possibly due to increased fiber, potassium, and folate intake, which are independently associated with a reduced risk of cardiovascular disease [53]. Also, the liver plays an essential role in regulating nutritional status and energy balance. As a result, malnutrition has a high prevalence in people with liver disease and has been reported from 65 to 90 percent [54]. Therefore, malnutrition in these patients has multifactorial reasons. In this context, it has been reported that people with alcoholic fatty liver disease are more likely to suffer from malnutrition due to the effects of chronic alcohol abuse [54]. On the other term, non-alcoholic fatty liver disease is known as the most common liver disease and malnutrition has a high prevalence in these patients. Also, recent studies show that this disease is associated with impairment in liver enzymes homeostasis and diet modification is used as a therapy solution in these patients [55].

The existing studies indicate a high prevalence of malnutrition in the elderly with kidney disease [56]. One of the most important mechanisms of malnutrition in diabetic patients is due to Protein-energy wasting (PEW) [57]. Aging, in turn, is associated with increased protein catabolism, and kidney disease including chronic kidney disease, leads to an increase in the severity of PEW and is associated with increased morbidity as well as exacerbation of malnutrition [57].

In sum, it can be stated that malnutrition is associated with an increased risk of chronic non-communicable diseases, furthermore, many diseases due to their pathological and physiological nature lead to changes in body homeostasis and the incidence of malnutrition. This subject is ultimately associated with increased multiple medication and comorbidity and increases the risk of premature death.

Physical activity

In the present research, an inverse and significant relationship between the level of physical activity with cardiovascular disease ($P < 0.004$) and comorbidity ($P < 0.038$) was observed. Also, the incidence of cardiovascular disease, comorbidity, and kidney disease in people with a high level of physical activity (HLP) was significantly lower than the group of low levels of physical activity (LLP). The results of many experimental and clinical studies show that regular physical activity has many effects on improving performance and strengthening the health system and through various mechanisms leads to a reduction in cardiovascular disease [53,58]. In this field, several mechanisms are involved. Aging in turn leads to increased oxidative stress and this issue is one of the most important causes of cardiovascular disease [59], while there is a strong evidence that indicates the increase the level of physical activity in the elderly period is associated with reduced oxidant base production and increase the capacity of the body's antioxidant system and also through the improvement of other pro-survival mechanisms leads to a delay in the aging process and reduction of aging-related diseases, especially cardiovascular disease [58]. On the other hand, the positive effects of physical activity on the improvement of functional indicators and prevention of disability in the elderly have been proven [26]. Disability is one of the most important factors in reducing the level of physical activity in the elderly, which leads to the occurrence and development of various diseases and mortality [60]. Therefore, physical activity as a safe solution leads to the improvement of functional indicators and prevention of disability in the elderly [26] and in this way, it leads to the reduction of various diseases and mortality

Conclusion

The results of this study indicated that the level of physical activity and food dietary can be used as safe and cost-effective solutions to prevent various diseases and polypharmacy in the elderly.

Limitations of the Study

This study was constricted to Tehran and this reduces the generality of the results. Also, due to the cross-sectional design, this study was not able to show cause-and-effect relationships as well. Also, evaluation the history of physical activity during the whole life could provide more complete information. Plus, lack of evaluation the health insurance status and economic status of the subjects was another limitation of this study.

Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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