EPMA Journal (2019) 10:115–123
https://doi.org/10.1007/s13167-019-00172-3

RESEARCH

Determining health-promoting behavior in smokers preparing to quit: a holistic and personalized approach

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Received: 27 January 2019 / Accepted: 15 May 2019 / Published online: 25 May 2019

Abstract

Background Smoking cessation practices enable health professionals to identify lifestyle of their patients as an initial step to achieve predictive, preventive, and personalized medicine (PPPM). In this study, we aimed to investigate the relationship between the smoking habit and health-promoting behavior of patients who planned to quit smoking.

Methods In this descriptive study, Health-Promoting Lifestyle Profile II (HPLP-II) was implemented to current smokers admitted to smoking cessation outpatient clinics of two tertiary hospitals. Patients without any comorbidities were included. Sociodemographic variables, Fagerström dependency test, and smoking habit were recorded. Descriptive and analytical statistical evaluations were performed.

Results A total of 200 patients, 134 men (67%) and 66 women (33%) with a mean age of 34.49 ± 8.82, were included to the study. Among them, 90 (45%) were white collar, and 110 (55%) were blue-collar workers. Patients with BMI ≥ 25 were 126 (63%); Fagerström test score median was 7. Packages per year, dependency scores, the age the patients started smoking, and cigarettes smoked per day inversely correlated with health-promoting behavior. Our patients had high scores in spiritual growth and interpersonal relationships and had low scores in physical activity and stress management. Health-promoting behavior, health responsibility, self-actualization, and interpersonal relationships were less favorable in blue-collar workers than white-collar workers.

Conclusions Smoking behavior affects especially physical activity and stress management in the study population preparing for smoking cessation. Health-promoting activities in smokers are influenced by occupation as well as dependency levels and smoking habits. Differences exist among white and blue-collar workers in health-promoting behavior. Defining and screening multiple health risk behavior in smokers empower predictive measures and targeted preventive medicine, such as maintaining healthy nutrition and leaving sedentary lifestyle along with efforts to quit smoking. Awareness about health-promoting behavior and thus identifying smokers who need lifestyle interventions can provide and attenuate a holistic and personalized approach in preventive medicine.

Keywords Health promotion · Smoking cessation · Preventive medicine · Nutrition · Physical activity

Introduction

Smoking addiction is an environmental and public health problem in today's world, and yet, no perfect solution has been advised. Working people especially living in metropolitans tend to adopt multiple unhealthy behavior, including smoking, sedentary lifestyle, and unbalanced nutrition, which raises the risk of cardiovascular diseases, cancer, diabetes mellitus, stroke, and chronic obstructive pulmonary disease, consequently, morbidity and mortality worldwide. Combining public health and clinical medicine tools with genetical findings defines predictive and preventive approach in medicine, which leads to personalized medicine in the twenty-first

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century. For an effective personalized medicine, targeted prevention should be preceded by predictive measures of adequate qualitative and quantitative information regarding the patient involving the classical patient and family history, socioeconomic information, environment, behavioral lifestyle, and molecular biomarkers [1–3]. As it has been emphasized in the EPMA report, predictive medicine allows health professionals and patients to be proactive instead of being reactive, and this will enhance interventions and counseling provided by physicians, which potentializes to reduce the rates of the incidence and prevalence of diseases [4].

Health behavioral models are found together in the population, which lead to clusters. The impact of clusters of multiple risky health behaviors can be reduced through multiple health behavior changes [5]. It was reported that for different health behaviors, the process of change is similar; so, interventions on multiple behaviors can be effective and that the individual's motivation can be increased [6]. Fernald et al. have suggested that unhealthy behavior patterns contributing to the development of chronic disease and cancer should be addressed in primary care [7].

In a study conducted in primary care settings, it was reported that 96.8% of adults have at least one unhealthy behavior; 69.2% had two or more unhealthy behavioral patterns, including unbalanced diet, low physical activity, and smoking [8]. Predictive, preventive, and personalized medicine (PPPM) needs to be cost-effective as well as affordable and comprehensive; so, primary care practices can be the starting points for PPPM research.

In order to develop plans for health promotion, Prochaska et al. suggested that relationships between health behaviors of the population are needed to be described [9]. Primary care offers opportunities for health professionals to recognize the general health behavior of their patients and even their families in terms of holistic approach.

If health professionals recognize multidimensional health behavior in their patients, then certain interventions can be implemented to patients. Pronk et al. have reported that multiple behavioral risk factors are needed to be addressed in primary care and that researchers, practitioners, and policymakers collaborate on multiple risk factor interventions [10].

Pender has emphasized that health-promoting behavior is about wellness and self-actualization of an individual. Upon Pender's definition about lifestyle behavior [11] Health-Promoting Lifestyle Profile has been developed by Walker et al. [12] and has been revised as Health-Promoting Lifestyle Profile II (HPLP-II) [13]. Health promotion research has drawn attention, and HPLP-II has been extensively used in health promotion research through a variety of studies worldwide [14, 15]. Walker et al. reported that this scale could be used to identify the health-promoting behavior as well as to develop programs for health promotion [12].

The Ministry of Health of Turkey has introduced the health promotion programs in particular on smoking, obesity, and physical activity. Smoke-free life campaigns in media, smoking cessation outpatient clinics, and general prohibitions defining smoking areas and sales have been introduced with the intense efforts of the Ministry of Health since 2009 [16]. In order to improve the healthy lifestyle of the citizens, campaigns on obesity, healthy eating, and increased physical activity have defined the concept of health promotion. As a result of these efforts, smoking cessation outpatient clinics were established in hospitals.

In a prospective study, it was reported that by combining four healthy lifestyle factors, premature mortality could be reduced in both men and women, and those four factors were adherence to Mediterranean diet, keeping a normal BMI (18.5 to < 25.0), doing regular physical activity and being a nonsmoker [17]. International and local studies were conducted to investigate healthy lifestyle behaviors in many different populations, including elderly women [18], patients with chronic diseases [19], students [20–22], and workers [23–25].

Determinants of risky behavior are multifactorial. Smokers create a specific population that has to be examined under risky behavior. In our smoking cessation outpatient practice, we observed that unhealthy behavior accompanies smoking. In literature, studies about the association of healthy lifestyle behavior and tobacco addiction are not common. In this study, we explored the health-promoting behavior of current smokers who plan to quit smoking and to determine the relationship between smoking habits and unhealthy behaviors as an initiating step in PPPM scheme.

Methods

Study participants

The cross-sectional study was carried out in two tertiary training and research hospitals' smoking cessation outpatient clinics within 3 months' time. The patients who are older than 18 years can make appointments directly to the outpatient clinic associated with the family medicine department and apply themselves without a referral chain. The hospitals are located in a great metropolitan city. The routine follow-up in smoking cessation outpatient clinics involves at least four visits through the year. Patients who apply to the clinic are the inhabitants of the metropolitan city with different sociocultural backgrounds, but the workers have already adapted the manners and customs of being urban in metropolitan. After a brief definition of the study, consecutive patients with voluntary participation among those with no history of clinically diagnosed diseases were included. The other inclusion criteria were being literate, having no cognitive impairments,

being mobile, being older than 18 years of age, and to have been smoking in the past 6 months.

Data collection

A self-reported brief questionnaire asking about sociodemographic factors and smoking habits, which was prepared by the researchers, was implemented together with the HPLP-II scale. Patients who have received medication and who have been seeing a medical doctor regularly because of the diagnosis of a health condition were excluded from the study. Patients who did not complete the questionnaire were also not included.

Structure of the scale

The reliability and validity of the HPLP-II for Turkish population were conducted in a primary health care center [14]. HPLP-II includes 52 questions and 6 subscales providing a comprehensive assessment of health responsibility (HR), physical activity (PA), nutrition (N), spiritual growth (SG), interpersonal relationships (IR), and stress management (SM). Patients were asked to report each specific statement on a Likert-type scale. In this scale, patients chose 1, 2, 3, and 4, which expressed never, sometimes, often, and routinely, respectively, to convey information about the frequency of the behavior.

The highest possible HPLP-II total score was 208, while the lowest score was 52. HR, PA, N, SG, IR, and SM subscale scores may vary between 9–36 and 8–32. Total scores and scores of the subscales were calculated as described in the relevant articles; a high score revealed a better lifestyle profile that improves health [14].

The demographic variables were age, gender, educational background, marital status, presence of children, and occupation. A white-collar worker describes a person working in an office and doing a professional, clerical, or administrative work requiring mental effort. A blue-collar worker requires physical effort doing a manual labor.

The smoking habit information consisted of duration and dosage of smoking. The average number of cigarettes (1 package = 20 cigarettes) consumed per patient, age at starting smoking, smoking years which the patient has actively smoked, quit attempts, and Fagerström dependence test results were recorded. The Fagerström Test for Nicotine Dependence scores, which changes between 1 to 10, was revised by Heatherton et al., and the reliability analysis in Turkish was done by Uysal et al. [26, 27]. BMI ≥ 25 was considered overweight.

The hospital ethics committee for research has approved the study with the reference number 2016-525. Informed written consents were obtained from the patients. The study was conducted in compliance with the Declaration of Helsinki.

Statistical analysis

In this study, statistical evaluations were done by NCSS 2007 Statistical Software (UT, USA) program. The total score of the scale, scores of the subscales, sociodemographic features, and smoking habit of the patients were analyzed for any associations. Descriptive statistical methods by means and standard deviations and frequencies were expressed for categorical variables. Comparisons between groups were made by one-way variance analysis, and subgroup analysis was done by Tukey multiple comparison tests and t tests. Correlations were made by Pearson correlation tests. Correlation coefficient (r) was accepted as follows: 0–0.24 weak, 0.25–0.49 medium, 0.50–0.74 strong, and 0.75–1.00 very strong. For statistical significance, $p < 0.05$ was accepted.

Results

During a period of 3 months, 272 patients admitted to the smoking cessation outpatient clinic were eligible to be included to the study. Among these patients, 43 patients did not want to participate; 29 questionnaires were not completed and were excluded; thus, we concluded this study with 200 patients. All the participants went through the stage of contemplation and were in the preparation stage of smoking cessation that they intended to take action within the next 30 days [28] and have at least applied to the smoking cessation outpatient clinic as a behavioral step. The patients' age at starting smoking ranged from 8 to 33 years. Active smoking years of the patients changed from 3 to 43. Cigarettes smoked per day differed from 5 to 60. Patients who never have attempted to quit smoking were 37 (18.5%), and those who have attempted to quit once, twice, or three times were 70 (35%), 46 (23%), and 20 (10%), respectively. Only 27 (13.5%) of patients had tried quitting 4 to 10 times.

In the study group, Fagerström test score median was 7, which showed high dependency.

Sociodemographic factors

In our daily practice, 65% of patients who have applied to the smoking cessation clinics were men. This study consisted of 134 men (67%) and 66 women (33%) with a mean age of 34.49 ± 8.82. The patients were mostly in the fourth decade with a median of 33 years of age, and the age range was 20 to 60 years. The patients aged between 20 and 30 years were 37.5% (n: 75), those between 31 and 40 years of age were 39.5 (n: 79), and 23% (n: 46) were > 41 years.

In the patient group, 42 (21%) had primary education, 40 (20%) had secondary school, 51 (25.5%) had high school, and 67 (33.5%) had university education. Among them, 124 (62%) patients were married, and 109 (54.5%) patients had children.

Patients who were overweight with BMI ≥ 25 were 126 (63%), of whom only 25(12.5%) were obese with BMI ≥ 30.

When we divided the patients according to their occupations, 90 (45%) patients were white-collar workers among whom financial accountants and clerks were the main group ($n = 26$), and 110 (55%) were blue-collar workers among whom textile workers were the main group ($n = 41$).

Table 1 shows the HPLP-II scores according to the subgroups of demographic characteristics.

The overall scale score of our patients was 126.22 ± 20.53. The highest scores in the subscales were in spiritual (26.33 ± 4.65) and interpersonal relationships (25.38 ± 4.42), while the lowest scores were in physical activity (15.64 ± 5.40) and in stress management (18.11 ± 3.71).

The characteristics of smoking habit related to smoking history and HPLP-II scores of patients are presented in Table 2.

In nutrition subscale, there was a statistical difference between the age groups ($p = 0{,}018$). When one-way Tukey variance analysis is performed, the mean scores of the patients > 40 years of age had higher than the patients between the ages of 31 and 40 ($p = 0.015$). No associations were observed between the other mean subscale scores and the age groups ($p > 0.05$). HPLP-II total mean scores were higher in patients over 40 years ($p = 0.545$).

There were no significant differences between genders among mean total scores and subscale scores except spiritual growth in which men had significantly higher mean scores than women ($p = 0.026$).

Physical activity and interpersonal relations scores were different among the education groups ($p = 0.004$ and ($p = 0.022$, respectively). Physical activity scores were higher in university graduates than those in primary school graduates ($p = 0.01$) and secondary school graduates ($p = 0.014$). Interpersonal relation subscale was higher in university graduates than those in secondary school graduates ($p = 0.024$).

Married group had significantly lower physical activity scores (14.55 ± 4.93) than the single group (17.41 ± 5.68)

Table 1 HPLP-II scores compared between different sociodemographic factors

	Total score	Health responsibility	Physical activity	Nutrition	Spiritual growth	Interpersonal relationships	Stress management
Age							
20–30 $n = 75$	126.57 ± 20.29	20.04 ± 4.31	16.37 ± 5.55	20.16 ± 3.90	26.36 ± 4.63	25.65 ± 4.50	17.93 ± 3.69
31–40 $n = 79$	124.48 ± 18.39	20.38 ± 4.56	14.95 ± 4.97	19.73 ± 3.76	26.16 ± 4.65	25.39 ± 4.10	17.7 ± 3.24
>40 $n = 46$	128.63 ± 24.26	20.78 ± 5.46	15.61 ± 5.78	21.72 ± 3.75	26.57 ± 4.77	24.91 ± 4.85	19.09 ± 4.35
p	0.545	0.698	0.263	0.018*	0.896	0.673	0.114
Gender							
Men $n = 134$	127.08 ± 21.42	20.24 ± 4.87	15.82 ± 5.39	20.19 ± 4	26.84 ± 4.62	25.67 ± 4.41	18.19 ± 3.81
Women $n = 66$	124.47 ± 18.62	20.56 ± 4.3	15.26 ± 5.44	20.68 ± 3.62	25.29 ± 4.58	24.79 ± 4.42	17.94 ± 3.53
p	0.399	0.649	0.489	0.397	0.026*	0.185	0.659
Education							
Literate or Primary school $n = 42$	121 ± 22.79	19.98 ± 4.98	14.19 ± 4.93	20.38 ± 4.56	24.93 ± 5.13	23.71 ± 4.59	17.62 ± 3.58
Secondary school $n = 40$	122.68 ± 15.83	19.2 ± 4.28	14.28 ± 4.68	20.18 ± 3.5	26.3 ± 3.81	24.98 ± 4.01	17.6 ± 3.47
High school $n = 51$	126.9 ± 23.43	20.12 ± 5.25	15.49 ± 5.44	20.51 ± 3.80	26.55 ± 5.13	26.04 ± 4.66	18.14 ± 4.42
University $n = 67$	131.09 ± 18.29	21.43 ± 4.09	17.46 ± 5.59	20.31 ± 3747	27.06 ± 4.29	26.16 ± 4133	18.69 ± 3.30
p	0.055	0.093	0.004**	0.982	0.134	0.022*	0.377
Marital status							
Married $n = 124$	124.87 ± 20.57	20.08 ± 4.82	14.55 ± 4.93	20.19 ± 3.8	26.58 ± 4.71	25.31 ± 4.55	17.97 ± 3.79
Single $n = 76$	128.42 ± 20.41	20.78 ± 4.44	17.41 ± 5.68	20.61 ± 4	25.92 ± 4.55	25.5 ± 4.24	18.33 ± 3.59
p	0.236	0.309	0.0001***	0.467	0.332	0.765	0.505
Work							
White collar $n = 90$	130.19 ± 19.96	21.19 ± 4.63	16.32 ± 5.16	20.29 ± 4.01	27.22 ± 4.37	26.39 ± 4.33	18.66 ± 3.68
Blue collar $n = 110$	122.97 ± 20.51	19.65 ± 4.63	15.07 ± 5.54	20.4 ± 3.78	25.6 ± 4.77	24.55 ± 4.35	17.65 ± 3.7
p	0.013*	0.021*	0.103	0.841	0.014*	0.003**	0.058

Values are expressed as means ± standard deviation

*$p < 0.05$

**$p < 0.01$

***$p < 0.001$

Table 2 Characteristics of smoking habit and HPLP-II scores of patients

Variables and scores	Mean ± SD	95% CI	Median	Minimum	Maximum
Age	34.49 ± 8.82	33.25–35.71	33.00	20.00	60.00
Smoking habits					
Age at starting	17.81 ± 4.16	17.22–18.38	17.00	8.00	33.00
Cigarettes/day	23.66 ± 9.96	22.27–25.04	20.00	5.00	60.00
Smoking years	16.56 ± 8.14	15.42–17.69	16.00	3.00	43.00
Packages/year	20.39 ± 15.54	18.22–22.55	16.00	1.80	105.00
Quit attempts	1.75 ± 1.53	1.53–1.95	1.00	0.00	10.00
Fagerström score	6.22 ± 2.26	5.90–6.53	7.00	1.00	10.00
HPLP-II[a] scores					
Health responsibility	20.35 ± 4.68	19.69–20.99	20.00	11.00	33.00
Physical activity	15.64 ± 5.40	14.88–16.38	15.00	8.00	30.00
Nutrition	20.35 ± 3.87	19.81–20.89	20.00	12.00	32.00
Spiritual growth	26.33 ± 4.65	25.68–26.97	27.00	14.00	36.00
Interpersonal relationships	25.38 ± 4.42	24.76–25.99	25.00	12.00	36.00
Stress management	18.11 ± 3.71	17.58–18.62	18.00	10.00	28.00
Total score	126.22 ± 20.53	123.35–129.08	126.00	80.00	183.00

[a] HPLP-II: Health-Promoting Lifestyle Profile II

[b] SD: standard deviation

[c] CI: confidence interval

($p = 0.0001$). The group who had children had significantly lower physical activity scores (14.72 ± 5.03) than those who had no children (16.73 ± 5.64) ($p = 0.009$).

There were no statistically significant differences between the mean total and subscores in BMI < 25 and BMI ≥ 25 groups. In addition, there was no statistically significant relationship between BMI values and total and subscale scores ($p > 0.05$).

In blue-collar workers, total mean scores ($p = 0.013$) and health responsibility ($p = 0.021$), spiritual growth ($p = 0.014$), and interpersonal relationship ($p = 0.003$) scores were significantly lower than white-collar workers (Table 2).

Correlations

The age patients started smoking weakly correlated with total score ($r = 0.163$, $p = 0.021$), health responsibility ($r = 0.212$, $p = 0.003$), physical activity ($r = 0.154$, $p = 0.029$), nutrition ($r = 0.157$, $p = 0.026$), and stress management ($r = 0.150$, $p = 0.034$).

Negative and weak correlations were found between Fagerström dependency test and health responsibility ($r = -0.193$, $p = 0.006$); physical activity ($r = -0.196$, $p = 0.005$), nutrition ($r = -0.244$, $p = 0.0001$), stress management ($r = -0.185$, $p = 0.009$), and the total scale scores ($r = -0.205$, $p = 0.004$). There was no significant relationship between Fagerström scores and spiritual growth and interpersonal relations ($p > 0.05$).

Cigarettes smoked per day were correlated with total score ($r = -0.213$, $p = 0.002$), health responsibility ($r = -0.229$, $p = 0.001$), physical activity ($r = -0.149$, $p = 0.035$), nutrition ($r = -0.192$, $p = 0.006$), and stress management scores ($r = -0,200$, $p = 0.005$) in a weak but negative way.

Smoking years were correlated negatively with physical activity subscale scores ($r = -0.171$, $p = 0.016$).

Packages per year negatively and weakly correlated with health responsibility ($r = -0.216$, $p = 0.002$), physical activity ($r = -0.215$, $p = 0.002$), interpersonal relationships ($r = -0.159$, $p = 0.025$), and the total scale score ($r = -0.207$, $p = 0.003$). Packages per year did not correlate with nutrition, spiritual growth, and stress management ($p > 0.05$).

The number of smoking cessation attempts was not correlated either with the total or the subscale scores ($p > 0.05$).

There was a weak negative correlation between physical activity score and number of children the patients had ($r = -0.227$, $p = 0.001$).

Discussion

Health care rather than disease care has changed the concept of research projects about a certain disease or causes of disease. Prediction, prevention, prediction, early diagnosis, adequate treatment and follow-up, and rehabilitation process included in terms of personalized medicine principles are emphasized in the literature [1]. Smokers have the presence of multiple unhealthy behaviors. We concentrated beyond smoking addiction and determined that smoking habit was associated with unhealthy lifestyle behaviors. This study was

conducted in patients preparing for smoking cessation and demonstrated that smoking behavior affects physical activity, stress management, and health responsibility. This cluster of multiple unhealthy behaviors is explored in the next sections.

Smoking habits and health-promoting behavior

The age at which our patients started smoking is related to health responsibility, physical activity, nutrition, stress management, and the total health-promoting lifestyle scores indicating that the patients are less likely to practice health-promoting behavior if they start smoking at an earlier age. It was reported that non-smoking students had higher health responsibility, nutrition, spiritual growth, interpersonal relationships, and stress management scores [20]. Smoking addiction starts at younger ages and can be accompanied by other health risk behaviors, such as sedentary lifestyle and unhealthy nutrition habits. In a former study, younger patients especially men who had a history of acute coronary syndrome were reported to continue smoking, and it was advised that in order to prevent recurrent cardiovascular events, young patients and male patients were the two groups which health professionals need to concentrate on for motivation towards quitting smoking [29].

Health responsibility, physical activity, interpersonal relationships, and general health-promoting behavior of our patients were less observed as the cigarette pack/year increased. Higher nicotine dependency was associated with less health responsibility, physical activity, nutrition, and stress management. Nicotine dependency may be related to avoiding health-promoting behavior, including balanced nutrition and adequate physical activity; this creates an unhealthy lifestyle with less emphasis on health responsibility and less stress control. Frequency of maintaining a healthy diet was higher in men and women who were nonsmokers, and as the duration and frequency of smoking decreased, the score of healthy eating increased [17].

Work type

In our study, we found that health-promoting behavior in smokers is associated with the type of work. Thus, smokers with a profession in the blue-collar category practice health-promoting behavior less than those in white-collar employees, who are high school and university graduates with higher income which can have an influence in health-promoting behavior. However, a study regarding the health-promoting practices of workers in Turkey revealed that there was no difference between blue- and white-collar workers in overall health-promoting lifestyle scores [25]. In the mentioned study, scores of physical activity and health responsibility were the lowest, and scores of interpersonal support and self-actualization were the highest [25]. Lusk et al. found that blue-collar workers had lower scores in overall HPLP-II, nutrition, self-actualization, interpersonal support, and physical activity than skilled trade and white-collar workers [30]. A similar result was observed in a Taiwanese study with workers of different professions, which revealed that general HPLP-II, nutrition, self-actualization, interpersonal support, and stress management scores were lower in blue-collar workers [31]. However, in another study conducted with workers from different sectors, the highest scores were in spiritual growth, followed by interpersonal relationships; the lowest were stress management and physical activity, and no difference was observed between blue- and white-collar workers [32].

Working for a goal in life and having good interpersonal relationships undermines spiritual growth, which leads to self-fulfillment and taking care of oneself, thus ensuring a higher health responsibility. Although health responsibility, spiritual growth, and interpersonal relationships were more noticeable in our patients in the white-collar category, we concluded that smokers either blue or white collared do not often practice healthy lifestyle behavior. Efforts must be given to raise awareness about health risk behaviors and health-promoting behaviors particularly in blue-collar workers. Stratification of patients considering available medical information, including worksites for optimal planning, is needed in identifying persons at risk [2].

Age, gender, and marital status

In this study conducted with active smokers, men, university graduates, singles, and patients over 40 years of age had higher health-promoting lifestyle profile. In literature, sociodemographic characteristics, such as age, gender, and marital status, were found to be associated with health-promoting lifestyle as well as profession [18, 19, 22]. In a study on health-promoting behaviors of blue-collar workers, health responsibility scores were higher in females than men; older workers had higher nutrition scores and lower physical activity scores than younger workers [24]. Female factory workers scored high in spiritual growth, while they scored less in physical activity, and among them health-promoting behavior scores were lower in smokers [33]. In Japan, Zhang et al. found that total HPLP-II scores were not different between the agricultural group and the non-agricultural group, and spiritual growth score was high and physical activity score was low in the agricultural group. Both older workers and female workers had significantly higher total HPLP-II scores. Health responsibility, interpersonal relationship, and nutrition were higher in older workers than the younger group [23]. Our patients over 40 years had higher nutrition scores than those between 31 and 40 years of age. As people get older, health problems begin to play an important role in the perception of life and health-promoting behaviors.

Spiritual growth is about development of self being and self-actualization [13]. In literature, it was found that spiritual growth was affected by gender, education, working status, and marital status [19, 20]. Marriage was found to affect health-promoting behavior in men with heart diseases, and spiritual growth, physical activity, stress management, and nutrition were better in married patients [19]. Higher spiritual growth and interpersonal relationships in our group may be associated with cultural factors of the society. Women had better scores than men in spiritual growth. In our patients, physical activity and stress management were low consistent with literature. In studies conducted in Turkey with different groups of people, the physical activity score was also found to be the lowest [20, 25, 34]. We have also found that married patients who had children had physical activity scores that were low, which may be due to the lack of time spared for physical activity. Thus much effort is needed to improve physical activity in different groups of smokers.

In healthy men, Nagaya et al. have found that smoking was accompanied by sedentary lifestyle, and interestingly, smoking cessation increased physical activity and relapses were associated with decreased physical activity [35]. In a study conducted in Canada, 22.57% of current smokers were reported to have participated in physical activity in their leisure time and that physical activity have enhanced cessation attempts [36]. In everyday smoking cessation practice, physicians can recommend smokers to increase their physical activities as a strategy to attenuate smoking cessation.

Education

Education was found to be effective in health promotion, and this may be related to increased awareness. Spiritual growth, health responsibility, physical activity, stress management, and general health-promoting behavior were lower in patients with heart disease who were graduates of primary school [19]. We found that university graduates had higher scores in physical activity and interpersonal relationships. This may be explained by having more opportunities for physical activity and being involved in socializing in society.

In a recent study of health risk behaviors in approximately 20,000 people in Germany, the level of education has been reported to reduce the risk of current smoking or risk of current smoking as well as being overweight, or risky drinking in addition to smoking and being overweight or risk of smoking plus being overweight plus low physical inactivity [37]. BMI was not associated with any of the components of the scale in our patients similar to another study in which health promotion lifestyle profile scores of high school students were not associated with obesity [21].

Our patients had low scores in stress management. Smokers are found to have anxiety, and this can lead to poor stress management. In a large-scale study, smoking was found to be associated with anxiety and depression in adolescents [38]. In another population-based study, anxiety and depression levels were found to be higher in smokers than those in non-smokers [39], whereas no difference was found between the presence of anxiety and/or depression according to the smoking status of workers [40].

Expert recommendations

Health professionals can use HPLP-II to determine the lifestyle of smokers and the effects of smoking cessation on other risky health behaviors. While managing a risky health behavior, other co-existing risk factors may be targeted also, and this intervention may improve smoking cessation treatment as well as other risk factors as suggested in literature [41]. If patients become aware of their multirisk health behavior, they can actively participate in the health care process. Experts suggest that PPPM programs can be applied in providing a new spectrum of screening programs, targeted prevention, cost-effective health care, knowledge integration, and interdisciplinary and multidisciplinary cooperation [1]. Behavioral screening may be implemented in screening programs. This can lead to individualized patient profiling and consequently a comprehensive and effective PPPM.

Defining the health-promoting behavior of the individuals besides their smoking habits should be considered as the first step in predictive diagnostics, targeted preventive measures, and personalized treatment algorithms.

Conclusions

We conclude that health-promoting activities in smokers are influenced by sociodemographic factors of gender, age, educational, and marital status, but the striking influence is associated with occupation as well as dependency levels and smoking habits. While physical activity and coping with stress skills are inadequate, interpersonal relationships and spiritual development are better, which we think is related to cultural factors among working smokers. In the daily medical practice, smoking cessation encouragement by health professionals is important especially in younger people. Targeting multiple risks, along with efforts to stop smoking, can encourage patients to take preventive measures, such as maintaining a healthy diet and increasing physical activity. Concurrent interventions for multiple behavioral changes involve awareness of health-promoting behavior, and thus, identifying smokers who need lifestyle interventions can provide and attenuate a holistic approach in preventive medicine.

Strengths and limitations

Most of the studies are carried with health professionals, because they are expected to be role models as they work for disease prevention and health promotion. Studies with women, elderly people, students, and working people utilizing HPLP II to assess the factors affecting healthy behavior are present, but we could not come up on a relevant study with active smokers. One of the strengths of the study is the specific population it was implemented. In both local and international literature, smoking is a characteristic of some participants, but active smokers who are ready to quit smoking within a short period of time is an exceptional group.

Another strength is that patients did not have any occupation related to health, have no physical or psychological comorbidities, and were not seeing a doctor or taking any medication. One limitation is not to have asked for income related to health behavior. Another limitation is that patients have different sociocultural backgrounds, and this may have affected health-promoting behavior. Further research on associations of different features can be planned in the future.

Author contributions DK and ADE designed the study and contributed to the data collection and data management. DK, ADE, and SA interpreted the results. DK wrote the paper. DK and ADE revised the paper. All authors reviewed the paper, provided significant feedback, and approved the final manuscript.

Funding information This article was not supported by any funding.

Compliance with ethical standards

Conflict of interests The authors declare that they have no competing interests.

Ethics approval and consent to participate The study protocol was approved by the Ethics Committee of the Hospital with the reference number 2016-525. All participants have provided written consent after a brief information.

Abbreviations BMI, body mass index; CI, confidence interval; SD, standard deviation; HPLP-II, Health-Promoting Lifestyle Profile II; HR, health responsibility; IR, interpersonal relationships; PA, physical activity; N, nutrition; SG, spiritual growth; SM, stress management

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