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Demographic and Life Styles Determinants of Somatic Complaints' Structures: A Cross-sectional Study on a Large Sample of Iranian Adults Using Factor Mixture Model

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ABSTRACT

Background: To identify somatic complaints dimensions, classify studied population and study the association of demographic and lifestyle factors with somatic complaints dimensions.

Methods: In a cross-sectional study conducted on 4763 Iranian adults, somatic complaints were assessed using a comprehensive 30-item questionnaire. Self-administered standard questionnaires were used to assess demographic and lifestyle factors. Factor mixture modeling (FMM) was used to identify somatic complaints dimensions and classify studied population.

Results: The mean age of participants was 36.58 ± 0.13 years, 55.8% were females, 81.2% were married, and 57.2% had college education. About 9.4% of individuals were obese, and 34.8% of participants had regular physical activity. Four domains of somatic complaints were extracted, including "psychological," "gastrointestinal," "neuro-skeletal," and "pharyngeal-respiratory." Females, obese and inactive participants, and those in low educations had significantly greater scores in terms of four domains than the others ($P < 0.05$). A two-class, four-factor structure fitted to the somatic complaints based on FMM. Two classes were labeled "high psychological complaints" (519 individuals (11%) and "low psychological complaints" (4243 individuals (89%). There were no significant differences between two classes in terms of demographic and lifestyle factors, except in educational level.

Conclusions: This study suggested that somatic complaints had a dimensional-categorical structure within studied population so that it could be useful for dealing with diagnostic and therapeutic approaches. The results did not show any association between somatic complaints dimensions and demographic, lifestyle factors, except in educational level.

Keywords: Demographic factors, factor mixture modeling, lifestyles, somatic complaints

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INTRODUCTION

Somatic complaints are physical symptoms of which presence, severity or consequences cannot be explained by any detectable physical disorder.[1] These are common in the general population, and they are prevalent in patients attending primary care, secondary care, and in different medical conditions.[2,3] The prevalence of somatic complaints varies depending on several factors such as gender, age, and socioeconomic status.[1,4] The reported prevalence rates in primary care varying between 25% and 50%[1,5] and these symptoms are more prevalent among women and in old age populations.[1,6] Furthermore, it is reported that individuals with less education tend to report more somatic symptoms.[7] Some studies showed relationships between less physical activity, higher body mass index (BMI), and higher levels of psychological, gastrointestinal, and respiratory somatic complaints.[8,9]

Some studies indicated that there is notable heterogeneity in term of somatic complaints among the studied populations.[10-12] Different statistical methods such as factor analysis and latent class analysis (LCA) have been used for dealing with identifying heterogeneity.[10,11] Factor mixture modeling (FMM)[13] is a relatively new methodological procedure that unifies factor analysis and LCA in a single analysis and allows the underlying structure to be simultaneously dimensional and categorical. The structure is considered categorical to classify individuals into subgroups and (latent classes) it is also considered dimensional to account for heterogeneity within groups using continuous latent variables (latent factors). Hence, the primary objective of the current study was to identify somatic complaints dimensions (latent factors) and to classify studied population (latent classes) based on constructed somatic complaints dimensions using FMM. Such stratification could provide the foundation for differentiating some subgroups of population with different somatic complaints dimensions for dealing with diagnostic and therapeutic approaches. Other objectives of our study were studying the association of some main demographic and lifestyle factors with somatic complaints dimensions and evaluating their association with the prevalence of somatic complaints latent class.

METHODS

Study design and participants

This cross-sectional study was conducted in the framework of SEPAHAN project that was performed in two phases in a large sample of the Iranian population adults in Isfahan province.[14] Data on 4762 subjects were used in the current study. Informed consent was obtained from all subjects. More details about the SEPAHAN's study design have presented elsewhere.[14] The Bioethics Committee of Isfahan University of Medical Sciences (IUMS), Isfahan, Iran, approved the study (Project numbers: #189069, #189082, and #189086).

Procedures and assessment of variables

Assessment of somatization

In SEPAHAN project, there is not a separate questionnaire to assess somatic complaints however, we found 31 common items among questions contained in SEPAHAN's questionnaires with the 47-item questionnaire used in the Lacourt *et al.*'s study[12] and the patient health questionnaire,[15] as standard tools for the assessment of somatic complaints, therefore, we established a 31-item validated questionnaire. It was used to evaluate the frequency of somatic complaints. Respondents could indicate to how much they had experienced each symptom in the past 3 months on a 4-points Likert scale (1 = never, sometimes, often, always). For one item (i.e., dry mouth), the rating scale was as: never, low, and high. We conducted a separate mini survey of 100 participants selected randomly to assess the reliability of this instrument. There was strong internal reliability, with a Cronbach's alpha score of 0.903.[16] In this study, we used 30 items from 31 items.

Assessment of other variables

Age (years), gender (male/female), marital status (married, single), self-reported weight (kg), and height (cm) were gathered using a self-administered standard questionnaire. BMI was calculated by dividing weight in kilograms by height in meters squared. Educational attainments categorized into three categories as lower than diploma (12 years formal education), diploma and more than diploma (including bachelor, master, and doctorate). General Practice Physical Activity Questionnaire was used to assess an individual's current physical activity status. It generates simple, 4-levels Physical Activity Index categorizing subjects as: active, moderately active, moderately inactive and inactive.[17] In the current analysis, participants were classified into two categories, i.e., inactive (including inactive and moderately inactive) and active (including moderately active and active) as indicated earlier.

Statistical analysis

At first, factor analysis (based on principal component extraction approach) was conducted on the thirty individual somatic complaints. The orthogonal varimax rotation procedure was used to find the interpretable factors. In this study, we retained factors with eigenvalues >2 as this cutoff could result in more interpretable somatic complaints profiles and explained sufficient amounts of overall variation. Four main somatic complaints profiles were extracted and labeled based on the loaded somatic complaints in each factor. Then, we used LCA to determine the number of latent classes in studied population, and two latent classes were identified. Finally, we conducted FMM with four factors and two latent classes using

the FactMixtAnalysis package in the free Software Environment for Statistical Computing R. Factor means were allowed to be free across classes while factor loadings were restricted to be equal. Entropy index is provided, which is a useful criteria for assessment of the value and utility of the extracted classes. Entropy ranges from 0 to 1 and its higher values indicate better separation between classes and that individuals are properly classified.[18]

Quantitative and qualitative variables were presented as mean ± standard error and number (percent), respectively. Analysis of variance or independent Student's *t*-test was used for comparing quantitative variables among studied groups. Distribution of study participants in terms of categorical variables was compared between different classes using the Chi-square test. Data analyses were performed using Statistical Package for Social Sciences version 20 (SPSS Inc., Chicago, IL, U.S.A.).

RESULTS

Overall, 4762 adults contributed in the study. The mean age was 36.58 ± 0.13 years. They consisted of 2657 (55.8%) females and 3776 (81.2%) married. 2650 (57.2%) of the study participants had college education. About 3.5% of individuals were underweight, 37.1% were overweight and 9.4% were obese. 34.8% of participants had regular physical activity (moderately active and active).

Extraction of somatic complaints profiles using factor analysis

Four factors were extracted based on thirty individual somatic complaints and labeled as "psychological," "gastrointestinal," "neuro-skeletal," and "pharyngeal-respiratory" [Table 1]. The four factors accounted for 12.4%, 12.3%, 11.4%, and 9.3% of the total variance, respectively.

Table 1: Factor loadings for the four extracted somatic complaints profiles from thirty somatic complaints

Somatic complaints	Factor loadings*			
	Psychological	Gastrointestinal	Neuro-skeletal	Pharyngeal-respiratory
Sleep disorder	0.455			
Pounding heart	0.410		0.414	
Feeling low on energy	0.685			
Feeling like "butterflies"	0.784			
Difficulty concentrating	0.644			
Disturbing thoughts	0.795			
Chest pain		0.520		
Feeling of fullness		0.685		
Nausea		0.503		
Gastroesophageal reflux		0.540		
Pain or discomfort in the abdomen		0.711		
Constipation		0.490		
Diarrhea		0.358		
Bloating or swelling of the abdomen		0.667		
Anal pain		0.483		
Headache			0.572	
Back pain			0.659	
Pain in joints			0.638	
Eyesore			0.503	
Severe fatigue			0.606	
Dizziness and confusion			0.508	
Chills and extreme cold			0.420	
Hot flashes			0.381	
Dry mouth				0.311
Neck pain				0.560
Globus sensation				0.545
Having trouble swallowing				0.611
Shortness of breath				0.457
Hoarseness				0.605
Wheezing (asthma)				0.524
Variance explained (%)	12.4	12.3	11.4	9.3
Cumulative variance	12.4	24.7	36.1	45.4

*Factor loadings <0.3 are not shown for simplicity

Comparison of mean somatic complaints profiles across the different categories of demographic and lifestyle characteristics

As shown in Table 2, means of four somatic complaints profiles for females, individuals with educational level of under diploma, obese and inactive participants were significantly greater than others ($P < 0.05$). Furthermore, mean neuro-skeletal profile for married participants was significantly greater than single participants ($P < 0.01$).

Factor mixture modeling

The structure of study population in terms of four somatic complaints profiles (i.e., "psychological," "gastrointestinal," "neuro-skeletal," and "pharyngeal-respiratory") was examined using FMM. The two identified classes were labeled as "high psychological complaints" and "low psychological complaints;" as can be seen those participants in the first class experienced higher scores of psychological somatic complaints (mean: 0.249 vs. 0) while lower scores of somatic complaints in physical domains (gastrointestinal, neuro-skeletal, and pharyngeal-respiratory) [Table 3]. There were 519 individuals (11%) in the high psychological complaints class and 4243 individuals (89%) in the low psychological complaints class. Table 3 contains factor loadings and means for the two-class four-factor solution with free factor covariances and means. Approximately, all items loaded significantly on their respective factor.

Demographic and lifestyle characteristics determinants of class membership

The distribution of demographic and lifestyle characteristics of study participants in extracted classes are presented in Table 4. The mean age was 36.59 ± 0.13 and 36.45 ± 0.40 years in low and high psychological complaints classes, respectively ($P > 0.05$). Although individuals belonging to high psychological complaints class were female predominant (57.4%), and the most of them was married (82.7); however, there are no significant differences between two classes. There was a significant difference between two classes in the term of educational level ($P < 0.0001$) and the majority of individuals belonging to low psychological complaints class had college education (58.8%). About 5.1% of individuals belong to high psychological complaints were underweight, 35.4% overweight and 11.1% were obese, suggesting no statistically significant different distribution of obesity over the somatic complaints profile's extracted classes. 68.9% and 64.8% of individuals affiliated to high and low psychological complaints

Table 2: Comparison of mean somatic complaints profiles across the different categories of demographic and life style characteristics

Demographic and life style characteristics	Somatic complaints profiles			
	Psychological	Gastrointestinal	Neuro-skeletal	Pharyngeal -respiratory
Sex				
Male	8.99±0.07	12.18±0.08	13.80±0.09	8.66±0.05
Female	10.23±0.07	13.38±0.08	16.02±0.09	8.85±0.04
P	<0.0001	<0.0001	<0.0001	0.003
Marital status				
Married	9.69±0.06	12.91±0.06	15.14±0.07	8.76±0.04
Single	9.69±0.12	12.77±0.14	14.66±0.15	8.78±0.08
P	0.992	0.353	0.006	0.860
Educational level (years)				
Under diploma (<12)	10.36±0.16	13.30±0.19	15.90±0.22	9.27±0.11
Diploma (12)	9.83±0.10	12.80±0.11	15.30±0.13	8.97±0.06
University graduate (>12)	9.44±0.06	12.79±0.07	14.65±0.08	8.55±0.04
P	<0.0001	0.01	<0.0001	<0.0001
BMI				
Under-weight	10.17±0.30	13.27±0.33	15.71±0.36	8.91±0.18
Normal	9.59±0.07	12.66±0.08	14.81±0.09	8.67±0.05
Over-weight	9.58±0.08	12.95±0.10	14.99±0.11	8.71±0.05
Obese	10.21±0.18	13.35±0.21	15.85±0.24	9.11±0.11
P	0.001	0.002	<0.0001	0.001
Physical activity				
Inactive and moderately inactive	9.93±0.06	13.16±0.08	15.39±0.08	8.86±0.04
Moderately active and active	9.25±0.09	12.37±0.10	14.34±0.11	8.58±0.06
P	<0.0001	<0.0001	<0.0001	<0.0001

Values are mean±SE, *P* values from independent samples *t*-test or ANOVA test. ANOVA=Analysis of variance, SE=Standard error, BMI=Body mass index

Table 3: Factor loadings and means for the final two-class four-factor factor mixture modeling solution

	High psychological complaints class (n=519)		Low psychological complaints class (n=4243)	
	Mean	Loading	Mean	Loading
Psychological profile				
Sleep disorder	0.249	1.00	0.000	1.00
Pounding heart		0.36		0.36
Feeling low on energy		1.33		1.33
Feeling like "butterflies"		1.24		1.24
Difficulty concentrating		1.31		1.31
Disturbing thoughts		1.41		1.41
Gastrointestinal profile				
Chest pain	−0.435	1.00	0.000	1.00
Feeling of fullness		1.27		1.27
Nausea		0.97		0.97
Gastroesophageal reflux		0.94		0.94
Pain or discomfort in the abdomen		1.40		1.40
Constipation		0.91		0.91
Diarrhea		0.62		0.62
Bloating or swelling of the abdomen		1.33		1.33
Anal pain		0.98		0.98
Neuro-skeletal profile				
Pounding heart	−0.833	1.00	0.000	1.00
Headache		1.22		1.22
Back pain		1.21		1.21
Pain in joints		1.30		1.30
Eyesore		1.07		1.07
Severe fatigue		1.45		1.45
Dizziness and confusion		1.44		1.44
Chills and extreme cold		1.08		1.08
Hot flashes		1.12		1.12
Pharyngeal – respiratory profile				
Dry mouth	−1.372	1.00	0.000	1.00
Neck pain		1.58		1.58
Globus sensation		1.35		1.35
Having trouble swallowing		0.34		0.34
Shortness of breath		1.94		1.94
Hoarseness		1.45		1.45
Wheezing (asthma)		1.32		1.32

classes, respectively, were physically inactive and moderately inactive, suggesting marginally higher levels inactivity among population belong to high psychological somatic complaints profile class ($P < 0.1$).

DISCUSSION

In this cross-sectional study, among a large sample of Iranian adults, we extracted four somatic complaints profiles (i.e., "psychological," "gastrointestinal," "neuro-skeletal" and "pharyngeal-respiratory") from factor analysis. The current study based on FMM also provided support that our studied population comprises two-class, four-factor underlying structure of the somatic complaints. The two identified classes were labeled "high psychological complaints" and "low psychological complaints." Although results of conducted statistical methods suggested that in this sample of the Iranian adults there were two distinct classes of individuals with inherent elevated psychological complaints, and with inherent low levels of psychological complaints; however, participants in both classes had other complaints profile, such as gastrointestinal, skeletal, and respiratory symptoms with different degrees. We did not find any study such as ours, which stratified a general population into more homogeneous subgroups based on somatic complaints using factor mixture models. However, some studies identified heterogeneity in terms

Table 4: Demographic and life style characteristics of study participants in somatic complaints profile's classes

	Low psychological complaints class ($n=4243$)	High psychological complaints class ($n=519$)	P*
Demographic characteristics			
Age (years)	36.59±0.13	36.45±0.40	0.72
Females	2359 (55.6)	298 (57.4)	0.43
Marital status			
Married	3356 (81.0)	420 (82.7)	0.368
Educational level (years)			
Diploma (12)	1164 (28.2)	184 (36.4)	<0.0001
University graduate (>12 years)	2429 (58.8)	221 (43.8)	
Life style characteristics			
BMI	24.90±0.06	24.98±0.19	0.66
Under-weight	136 (3.4)	25 (5.1)	0.10
Over-weight	1513 (37.3)	172 (35.4)	
Obese	374 (9.2)	54 (11.1)	
Physical activity			0.074
Inactive and moderately inactive	2529 (64.8)	326 (68.9)	
Moderately active and active	1375 (35.2)	147 (31.1)	

Values are mean±SE and others are *n* (%), **P* values from independent samples *t*-test for continuous data and from Pearson Chi-square for categorical data. SE=Standard error, BMI=Body mass index

of somatic complaints between different populations using clustering, factor analysis or LCA[10-12,19] For instance, in the Fink *et al*.'s study, three latent factors, i.e., "cardiopulmonary," "musculoskeletal/pain," and "gastrointestinal" using factor analyses was extracted.[10] Fink *et al*. also though LCA identified homogeneous subgroups of individuals with somatic complaints and revealed that individuals fell into three classes: nonbodily distress, modest bodily distress, and severe bodily distress.[10] Kato *et al*. using LCA classified individuals into the four classes. Individuals belonging to the first class did not show any health problems. Those assigned to the second, third, and fourth classes have abnormal tiredness, gastrointestinal problems, and pain-related symptoms, respectively.[11]

When comparing mean somatic complaints profiles across the different categories of demographic and lifestyle characteristics, we found that females, obese and inactive Iranian adults had more somatic complaints. These findings were consistent with other previous studies.[7,20-29] In the Kroenke and Spitzer's study, symptoms such as abdominal pain, back pain, bowel complaints, chest pain, and dizziness were more prevalent in females.[7] Furthermore, Park and Knudson showed the prevalence of somatic symptoms for women was more than twice as those for men.[24] Some studies suggested that psychological and gastrointestinal symptoms are more frequent in overweight and obese subjects.[9,25-27,30] In line with our study, Berg *et al*. showed that obese persons report more somatic and psychological symptoms (such as a headache and problem sleeping).[28] In addition, some studies investigated the effect of BMI on respiratory and skeletal symptoms and pains.[20-23] Yoo *et al*. showed that BMI associated significantly with musculoskeletal pains.[23] In addition, Nilsen *et al*. indicated that high BMI and low physical inactivity are associated with an increased risk of chronic pain in the low back and neck/shoulders in the general adult population.[8] In line with our study, Jarvis *et al*. showed that persons with a BMI of >30 were in relation with an increased risk of respiratory symptoms, such as wheeze and shortness of breath compared.[20] In the present study, individuals with less education had significantly higher scores of all somatic complaints profiles. In the Kroenke and Spitzer's study persons with less education tended to report more somatic symptoms.[7] We also found that individuals assigned to the high psychological complaints class have lower education. Previous studies showed that higher educational attainment was strongly associated with better mental health in adulthood,[31] because higher levels of education are thought to generate additional economic resources, fewer chronic stressors, healthier lifestyles, more social support, and ultimately, better mental health.[31]

CONCLUSIONS

This study using FMM showed that somatic complaints profiles had a dimensional-categorical structure within studied population. FMM in the current study served as a tool to decompose heterogeneity and identify natural somatic complaints subgroups. This modeling strategy could be considered a foundation for differentiating subgroups of population with different disease dimensions.

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Conflicts of interest

There are no conflicts of interest.

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