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Original Research Article

Positive Self Rated Health in a Portuguese Population with Diabetes: Association with Socio-Demographic Characteristics and Behaviour Risk Factors Patterns

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ABSTRACT

Introduction: Self-rated health (SRH) is a health measure related to mortality, healthcare services utilization and quality of life. Given that behaviour related risk factors do not occur in isolation, rather they cluster together it is important to examine their patterns in a population with diabetes to inform a more holistic approach in both health promotion and illness prevention strategies. This study explores the association between the patterns of behaviour risk factors in a Portuguese population aged 15 years and over with diabetes and their SRH.
Methods: The study sample was derived from 2005/2006 Portuguese National Health Interview Survey. Associations with SHR were assessed using binary logistic regression model. SRH was categorized as positive (very good or good) and negative (fair, bad or very bad). Latent Class Analysis (LCA) was used to classify individuals in groups of behavioural risk factors patterns.
Results: Among the population with diabetes aged ≥ 15 years (226,068 valid cases), 11% reports positive SRH and 89% reports negative SRH. Men gender, younger age, higher level of education in contrast with lower education level´s, divorced and widower marital statuses in contrast with married were associated with positive SRH in the multiple logistic regression model. Physical activity and healthy diet were associated with positive SRH, after adjusting for socio demographics characteristics. Three behavioural risk factors patterns were identified: Physically inactive (83.3%), Smokers (11.2%) and Heavy drinkers (5.5%).
Conclusion: The perception of health status is essential for better planning in health, thus these findings have implications for policy makers to develop specific programmes aimed at improving public health.

Key words: Behavioural risk factors; Diabetes; Self rated health; Smoking; Alcohol

INTRODUCTION

Self-rated health (SRH) is a significant predictor of morbidity, mortality and the utilization of health services in current and preventative care [(1)] and it is based on the individual´s perception of his/her health status rated in a four or five-point scale. [(2)] It has been reported that diabetes is a cause of death that show a strong association with SRH. [(3)] SHR is one of the most common indicators of health in survey research and it has been recommended for health monitoring by both the World Health Organisation (WHO) and the European Union Commission. [(4)] Several determinants of SRH have been recognized such as demographic, socioeconomic, behavioural, psychosocial and disease related factors. [(2)] Currently, lifestyle health related habits such as smoking, excessive alcohol use, unhealthy diet and physical inactivity are gaining a growing attention in the international literature. [(5,6)] In general, individuals who follow a proactive lifestyle behavior report higher perceived health than those who do not. [(7)] The holistic approach to health recommended by WHO is focused on prevention, considering a set of modifiable factors in an integrated way. [(8)] Thus, the inspection of the clustering of behaviour risk factors is important to support a more holistic approach to health in both health promotion and illness prevention strategies. [(8)]

This study aimed to explore the association between the patterns of behaviour risk factors in a Portuguese population aged 15 years and over with diabetes *mellitus* and their SRH. The present study investigates the association of the patterns of behaviour risk factors with SRH, in contrast to most other studies, which focus on isolated behaviours.

MATERIALS AND METHODS

Study population

This cross sectional study is based on information collected from 2005/2006 Portuguese National Health Interview Survey. The study population comprised the Portuguese population aged 15 years and over with self-reported diabetes living in private households. This study evaluated the population surveyed in the second trimester because physical activity of respondents was only assessed in this trimester. Participants with less than 15 years and with missing data were excluded because the prevalence of diabetes in individuals with less than 15 years is negligible. [(9)] Sample size was 274,296 individuals, representative at national level, which is the weighted sample to account the probability of households and individuals being selected to take part in the survey sample. The sampling method was conducted from probabilistic samples of the Portuguese population, through interviews at home, using valid and stable instruments and methods. A description of the methodology of sample selection is published. [(9)] The population living in collective households and other non classical households (e.g. hospitals, prisons, military barracks or retirement houses) was not included in the survey. The sampling frame was selected from the nationally representative sample of all housing units in the five administrative regions (North, Centre, Lisbon region, Alentejo and Algarve) and the two autonomous regions of Azores and Madeira. The inclusion/ exclusion criteria include the target population units chosen among census lists. Within each parish is selected a sample of households in which is collected information about all residing individuals.Data from questionnaires of self-reported diabetic individuals, hereinafter referred to as diabetic, were then analysed. Informed consent from participants was obtained.

Measures

Socio-demographic variables. Sex, age, marital status and level of education were included in this study (see Table 1). Age was divided into six categories: 15–34, 35–44, 45–54, 55–64, 65–74 and ≥75); marital status was classified into single, married, divorced and widower; level of education was divided into four groups: none, primary, secondary and higher.

Smoking. People were asked "Do you smoke?". People answering "no" were considered non smokers, and those who answered "daily" or "occasionally", smokers.

Heavy drinking. Heavy drinking was defined as consuming an average of more than 2 drinks for men and 1 drink or more for women, per day. [(10)] A standard drink was that containing 10 g of alcohol, which in Portugal is a glass of beer, a glass of wine or a measure of distilled alcohol beverage. [(11)] Those respondents who stated they drunk during the previous week were asked questions about the average number of glasses of alcoholic beverages (including wine, beer, brandy, spirits, whisky/gin/vodka) drunk per day and the mean volume of each serving (for each type of alcoholic beverage) was assessed using visual aids. Daily alcohol consumption was assessed by average number of servings per day × mean volume of each serving × mean % alcohol (12% for wine, 5% for beer, 20% for liquor and 40% for spirits) × 0.8 (alcohol density) for each type of alcoholic beverage. [(12)] Total alcohol consumption in the day was assessed by summing up the individual amounts for each type of alcoholic beverage.

Physical inactivity. The respondents were asked about which was the time usually spent in one day during the previous week doing vigorous physical activities (e.g. heavy work, aerobics, running, swimming, or anything else that causes large increases in breathing or heart rate) and moderate physical activities (e.g. bicycling, vacuuming, gardening). Respondents were classified as being moderately physically active if they reported engaging in moderate intensity activity at least 30 minutes per day or vigorously physically active if they reported engaging in vigorous intensity activity at least 20 minutes per day. [(13)] So, the practice of less than 30 minutes of moderate physical activity per day or the practice of less than 20 minutes of vigorous physical activity per day was considered a risk factor. [(13)]

Unhealthy diet. The unhealthy diet was assessed in a previous study [(14)] that explored the unhealthy dietary pattern using current nutrition knowledge and latent class analysis. With respect to unhealthy dietary pattern, we reported dietary non diversity, non consumption of fruit and vegetables and number of main meals per day below three as indicators of an unhealthy dietary.

Self rated health. SRH was measured using a single item. Respondents rated their overall health on a scale with five possible response alternatives: 'very good', 'good', 'fair', 'bad' or 'very bad'. The answers were split into two SRH categories- positive (combining very good and good health) and negative (fair, bad and very bad health).

Statistical Analysis

We analysed the association between behaviour risk factors in a Portuguese population aged 15 years and over with diabetes and their SRH (Table 2). Before building the binary logistic regression model, an association analysis was performed between the SRH and each of the explanatory variables (socio-demographic characteristics and behaviour risk factors) using chi-square statistics (results not shown).

To identify the subgroups of the diabetic population (274,293 valid cases) with different behavioural risk factor patterns we used the LCA (see Table 3). To

select the appropriate number of classes, a two class model was first fitted to the data and compared to fitted models with an increasing number of latent classes (Table 4). This methodology was addressed by the authors in Costa *et al.* [(14)] For further details see the manuscripts published in the literature. [(15-20)]

Naming of classes is a subjective process and the classes were named in a way which best represented the most notable findings in the data. It is argued that while naming the classes makes presentation to the audience easier, [(21)] it is difficult to encapsulate the level of difference between classes with labels. Classes were assessed to determine the best possible name to represent the defining characteristics of individual classes.

Statistical Package for Social Sciences (IBM SPSS Statistics 20) and Latent Gold 4.5 (Statistical Innovations Inc. Belmont, MA 02478) were used to conduct the statistical analysis.

RESULTS

We identified the major behavioural risk factors (smoking, heavy drinking, physical inactivity and unhealthy diet) and SRH in a national sample with diabetes (see Table 1). Table 1 shows that over half of participants were women (61.0%). The majority of the sample individuals (76.6%) has aged 55 years and over. Over half of the individuals were married (68.6%) and had a primary education level (64.6%). About 14% of the study population smoked, 0.4% drank heavily on the least one occasion in the last week, 2.6% lacked physical activity and 89.6% had an unhealthy diet. Self rated health from fair to very bad accounted for the majority of the sample (73.3%).

Table 1. Socio-demographic characteristics, behaviours risk factors and self rated health of the Portuguese population aged 15 years and over with diabetes [a]

Variable	Diabetics(n = 274,293)	
	Frequency [b]	Percentage % [c]
Sex		
Men	107,078	39.0
Women	167,215	61.0
Age		
15-34	14,229	5.2
35-44	17,349	6.3
45-54	32,715	11.9
55-64	77,562	28.3
65-74	74,229	27.1
≥ 75	58,208	21.2
Marital status		
Single	18,657	6.8
Married	188,276	68.6
Divorced	10,152	3.7
Widower	57,208	20.9
Education level		
None	76,952	28.1
Primary	178,078	64.9
Secondary	9,614	3.5
Higher	9,649	3.5
Risk behaviours		
Smoking	19,329	7.0
Heavy drinking	986	0.4
Physical inactivity	8,109	3.0
Unhealthy diet	249,502	91.0
Self rated health		
Very good	2,742	1.0
Good	22,065	8.0
Fair	88,449	32.2
Bad	76,322	27.8
Very bad	36,490	13.3

[a] 2005/2006 Portuguese National Health Interview Survey, Trimester 2
[b] Weighted analysis expressed in terms of frequency of Portuguese population aged 15 years and over
[c] Weighted analysis expressed in terms of frequency of Portuguese population aged 15 years and over

Table 2 presents adjusted OR's from the binary logistic regression model between SRH and covariates that were found significant at the level of < 0.1 in the previous simple logistic model or Chi-square tests. Men had 2.65 higher odds for reporting positive SRH than women (95% CI: [2.55, 2.74]). When age is increased the OR decreased. Older age groups were less significantly associated with positive SRH than younger age groups. For example, individuals with 15-34 years old were almost seventeen times more likely to have a positive SRH than people aged over 74 years old. People with higher education

level reported a better SRH when compared with the people with lower education level´s.

Table 2. Multiple regression analysis of socio-demographic characteristics and behaviour risk factors with SHR as dependent variable

	Self rated health (positive *vs*. negative)	
	OR adj	95% CI
Sex		
Men	2.647	2.554, 2.744
Age (≥ 75)		
15-34	17.467	16.283, 18.738
35-44	13.073	12.244, 13.958
45-54	1.687	1.577, 1.805
55-64	1.288	1.222, 1.357
65-74	0.787	0.747, 0.829
Marital status (Married)		
Single*	0.957	0.899, 1.020
Divorced	5.007	4.716, 5.315
Widower	2.331	2.223, 2.443
Education level (Higher)		
None	0.617	0.571, 0.667
Primary*	0.968	0.901, 1.039
Secondary*	0.979	0.891, 1.075
Risk behaviours		
Smoking (Yes)	2.577	2.413, 2.752
Heavy drinking (Yes)	0.652	0.549, 0.775
Physical inactivity (Yes)	1.587	1.444, 1.744
Unhealthy diet (Yes)	1.298	1.242, 1.356

Note. The reference groups of predictor variables given in parentheses.
*p > 0.05 not significant in this multiple logistic regression analysis.

The OR associated to primary and secondary levels did not differ from high education level (p>0.05). Divorced people were nearly five times more likely to report a positive SRH when compared with married people and even the widowed people present a positive association with SRH, after adjusting for variables presented in Table 2. Binary logistic regression analysis revealed that alcohol consumption, physical activity and healthy diet were associated with positive SRH. The opposite effect was observed with smoking.

Table 3. Latent class analysis among diabetics: probability of latent class membership (last row) and item response probabilities within each of the three classes

Behavioural risk factors	Diabetics		
	Class 1	Class 2	Class 3
1. Smoking	0.000	1.000	0.000
2. Heavy drinking	0.000	0.284	0.716
3. Physical inactivity	1.000	0.000	0.000
4. Unhealthy diet	0.888	0.103	0.009
Probability of latent class membership	0.833	0.112	0.055

Class 1, Physically inactive class; Class 2, Smokers class; Class 3, Heavy drinkers class

Table 4. Criterion to assess model fit for LCA

	Diabetics		
Number of classes	2 class *vs* 1 class	3 class *vs* 2 class	4 class *vs* 3 class
LL	-186863.03	-186205.89	-186201.27
AIC_{LL}	373744.06	372439.78	372440.55
BIC_{LL}	373838.67	372586.95	372640.28
N par	9	14	19
Bootstrap *p-value*	0.0000	0.0060	0.2290

LL, log-likelihood; AIC, Akaike's Information Criterion; BIC, Bayes' Information Criterion; N par, Number of parameters

Table 4 shows the model fit statistics derived from LCA for the two to four latent class models when behavioural risk factors were included in the model. In selecting the final model, we examined the Log likelihood statistics, Bootstrap *p-value*, BIC and AIC criteria across models (see Table 4). The results from the LCA suggest a three classes solution based on Akaike and Bayesian Information Criterion´s and on the bootstrap p-values, assuming 1% and 5% significance levels. Also, when we test the three class model against four class model, according to the bootstrap p-values, assuming 1% and 5% significance levels, the plausibility of the three class model was point out. Thus, based on the principle of parsimony and the meaning of those three classes, this three class model seems to be more appellative.

The LC models identified three distinct class groups with homogenous patterns of unhealthy related behaviors will be described below. Of the 274,293 participants, 83% were classified as Physically inactive, 11% as Smokers and about 6% as Heavy drinkers (Table 3).

Class Profiles: Description

This section will detail the characteristics of each class and identify the specific group of people who were most likely to be in a particular class. Table 3 identified the unhealthy lifestyle class.

The Physically inactive class (83.3%): this group reported the highest probabilities of unhealthy diet (88.8%), all members were none smokers and lacked physical activity. This class contained the largest number of study participants.

The Smokers class (11.2%): all members were smokers, reported lowest levels of unhealthy diet (10.3%) and about 28% of the individuals drank heavily an average in the previous week.

The Heavy drinkers class (5.5%): all members were never smokers and they lacked physical activity and the majority of the sample (71.6%) drank heavily an average in the previous week (see Table 3).

DISCUSSION

To date, research on the association between health's related behaviours and self rated health has been limited. [22] Only a few studies have evaluated self rated health in community samples of people with diabetes and there is a lack of information regarding the association between self rated health and diabetes specific problems. [23] Our study aimed to evaluate the usefulness of SRH as an indicator of lifestyle related health status by examining the relationship between SRH and lifestyle habits in a Portuguese sample with diabetes aged 15 years and over. Using 2005/2006 Portuguese National Health Interview Survey data, three classes of health related behaviours were identified: Physically inactive, Smokers and Heavy drinkers and magnitude of the frequency of these behaviour risk factors patterns was determined in a population with diabetes. Physically inactive class (83.3%) accounted for the largest percentage of the Portuguese population with diabetes while the Heavy drinkers class accounted for the smallest (5.5%). Identification of these discernible patterns is important because of their relationship with mortality, morbidity and longevity. [24,25] Benjamins et al. [26] examined the relationship between SRH and mortality and reported that diabetes is a cause of death that show a strong association with SRH. Data from US and German cross-sectional studies showed three clusters of health behaviour including smoking, alcohol consumption, and physical activity and diet, [27] similar to our study.

The association between age, gender and poor SRH is well documented and it has been shown that women report poorer health than men, which is in line with our findings. [28] The findings show that men had higher odds than women to report better health of the SRH scale. Concerning age, previous findings confirm that ageing is linked with worse SRH. Our study is consistent with the findings of Darviri C. et al. [2]

Individuals with good to excellent SRH were more likely married or living with a partner. [23] Our results suggested that individuals with positive SRH were more likely divorced and widowed, after adjusting to other variables. Low education has been related to poor SRH in numerous studies. [29,30] Education is a key component of socioeconomic status affecting people´s opportunities for obtaining a better job and higher living standard. It can also affect people´s lifestyle and health behaviour which might explain the importance of education for health over and above purely wealth-related factors. Although Martinez-

Sanchez and Regidor [31] who also reported that the associations between educational level and negative health were of a small magnitude, our results are consistent with the findings of Mackenbach et al. [32] who found that higher education level was associated with positive SRH. Low socioeconomic status (SES) (in this study assessed by education level) and impaired health are well established determinants of poor SRH. [33] Although the link between SES and health inequalities is far from doubt, mediators of this relationship still remain elusive. The concept of psychosocial mediators, directly or indirectly linked to stress, seems most promising, since maladaptive stress responses entail a broader range of behavioral and physical changes leading to unhealthy lifestyle patterns and physical "wear and tear", all jeopardizing health. [34]

Previous research suggests that healthy lifestyle behaviours are associated with good self rated health in adults with diabetes, including regular physical activity, moderate alcohol intake and not currently smoking. [23] Our findings are consistent with Badawi et al. (2012) which confirmed that alcohol consumption and physical activity were associated with positive SRH. However, the opposite effect was observed in smoking. Exercise and healthy diet are well-known determinants of better SRH. [35] In general, physically inactive individuals reported lower health. [36] Our study has showed such results, even if our measurements were not based on validated physical activity and diet questionnaires. According to our findings, regular exercise and healthy diet are associated with better SRH.

We also looked at the patterns of behaviours risk factors e their association with SRH. As expected, individuals with healthier behaviour patterns [22] were more likely to report positive perceptions of their health. [37] To our knowledge, there no studies that have evaluated the patterns of behaviours risk factors and their relationship with self rated health in a Portuguese population with diabetes.

Limitations

The present study has certain limitations, which should be considered. First, the data used in this study is self-reported, so social desirability in responses may be an issue. Second, the design of Portuguese National Health is cross-sectional, which means that the data only provides a snapshot of the patterns of health behaviors among the population and in particular in diabetics. Therefore, we can only provide a snapshot of the current health behaviour of the participants. However, we hypothesize that our data reflects typical behaviour patterns. It also means that it not possible to establish whether a causal relationship exists between lifestyle patterns and self-rated health.

Finally, in such circumstances, the 'fair' SRH category may include respondents from both the positive and negative ends of the health spectrum, thus being less discriminative. It is essential to further explore the meaning of 'fair' health with its relative, value-related position on the SRH scale in relation to possible socio cultural differentiation.

CONCLUSION

Health inequalities are related to socio-demographics characteristics and lifestyle. This study shows that men, younger age, higher level of education in contrast with lower education level´s, divorced and widower marital status in contrast with married were all associated with positive SRH. Alcohol consumption, physical activity and healthy diet were associated with positive SRH, after adjusting for socio demographic characteristics. This research has also found three behavioural

risk factor patterns in diabetics: Physically inactive (83.3%), Smokers (11.2%) and Heavy drinkers (5.5%). It is therefore essential to develop specific interventions that consider these behaviour risk factors patterns in control programmes for diabetes.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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