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ORIGINAL ARTICLE

Prevalence of Various non-Communicable Diseases (NCDs) and NCD Risks Factors among Saudi Population-Analysis from SHIS 2013

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ABSTRACT

Non-communicable diseases like cardiovascular disease, cancer, chronic respiratory diseases and diabetes, along with respective risk factors, pose a public health problem in Saudi Arabia. This study was done using GBD-SHIS data to study the prevalence and risk factors of non-communicable diseases in Saudi Arabia. Data from nationally representative sample collected during Saudi health Interview Survey (SHIS) 2013 was analyzed. Among a total of 10195 respondents, the mean age was 37.9 years (SD 16.1), of which 5252 (51.5%) were female and 6623 (65.0%) were currently married. The most common NCD was asthma (3.65%), followed by myocardial infarction (0.67%) and stroke (0.48%) and renal failure (0.54%). The most common NCD risk factor was ever smoking (17.01%). Diabetes (11.40%) and hypertension (9.38%) were the other common risk factors. All the NCDs were higher in the age group >60 years. The study clearly highlights the high burden of NCDs and their risk factors among Saudi population. The study inputs are extremely useful for government, service providers and population to develop appropriate prevention, screening and management services.

Keywords: Non-communicable diseases, Aged, risk factors

INTRODUCTION

The world population is constantly changing, and morbidities due to chronic diseases have engulfed the globe from an initially predominance in western world. Middle eastern countries have a similar transition with significant social and health implications caused due to chronic disease in the elderly population [1–3]. Saudi Arabia is one of the Gulf Cooperation Council countries, with one of the fastest growing economies. It is estimated to reach more than 35 million population by the year 2025 [4]. More than 60% of Saudi Arabia's population is 35 years or less, and there is an increasing health care services demand [5].

In the year 2016, as a subpart of vision 2030, the health ministry of Saudi Arabia declared the renovation of the health system by enabling ease of access to health services, improving quality of care and improve quality of health services, and promote the prevention of risks factors. The focus was on preventive as well as therapeutic healthcare. As part of this action, in 2012, the Saudi Arabian Ministry of Health started a partnership with the "Institute for Health Metrics and Evaluation (IHME), which coordinates the Global Burden of Disease (GBD) study, to better analyze and comprehend the health of Saudi Arabia's population via the Saudi Health Interview Survey (SHIS)" [5,6].

Many Northern Africa and Middle Eastern regions have common health-influential factors such as religion and common ethnicity. However, considerable variations in health indicators are observed between these countries. With a particular focus on Saudi Arabia, the findings from the SHIS have shown an "increase in the burden of nutrition-related and lifestyle-related risk factors such as obesity, hypertension, and diabetes" [5]. A significant rise in the level of risk factors is seen among the young Saudi Arabian population [7]. In 2010, a GBD region-specific report for Saudi Arabia showed an "ongoing epidemic of non-communicable diseases and road transportation injuries" [8]. The primary cause of death was ischaemic heart disease, stroke, and road traffic injuries. Among the female population, depression was the primary reason for disability. Road traffic injuries were common among males. Upper limits of body mass index (BMI) and high values have been reported as one of the leading risk factors for chronic disease among the Saudi population [8].

So far, there was a lack of evidence of data that can be used to assess the health and quality of health care services of the Saudi Arabian population [9,10]. This gap was filled by the Saudi Health Interview Survey (SIHS), which was one of the new efforts commenced with "nationally representative data that has reported preliminary results" [5]. Documentation of disease impact and population health conditions play a significant role in surveillance. In this article, given the scarcity of analysis of the non-communicable disease burden and data on the risk factors of non-communicable diseases in Saudi Arabia, we used GBD-SHIS data to study the prevalence and risk factors of non-communicable diseases in Saudi Arabia.

MATERIALS AND METHODS

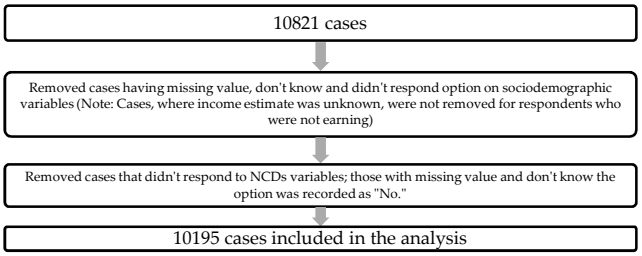
The current study was a retrospective observational study. Ssecondary data analysis was conducted on individual data collected on key NCDs and their risk factors during Saudi Health Interview Survey (SHIS) 2013. The survey was a nationwide representative survey in Saudi Arabia, conducted on adult population above 15 years of age.

The survey followed a multistage stratified probability sampling method to select a representative sample of the population. All the regions of the kingdom were included in the survey. The kingdom was divided into 13 regions and in each region clusters of households were marked. With average of 140 household in each cluster, they were named as enumeration unit. These enumeration units were considered as primary sampling units (PSU). Probability proportionate to size sampling was used in each stratum inorder to get representative samples. Based on which, 14 households in each PSU were randomly selected and contacted for the survey. A total of 12,000 households were contacted, out of which 10,827 households completed the survey. This adds up to response rate of 90%. Out of these, 5941 individuals

reported to the clinic for blood investigations. The clinic-based survey had a response rate of 55% (5,941/10,827), or a final response rate of 49.5% (5,941/12,000). We have retrieved the raw data collected during the survey from the official database and performed secondary data analysis. This study was approved by Ministry of Health. Post stratification was done to generalise the survey weights to the general population of Saudi Arabia. Hence, the methodology adjusted for self-selection bias in the clinic part of the survey. Indeed, participants who went to the clinic were more likely to be older women with certain pre-conditions. Consequently, our weights accounted for this bias.

Ministry of Health Saudi Arabia has implemented and overseen the survey operations. SHIS 2013 survey included two modules viz., household questionnaire and selected adult questionnaire. The questionnaire had details about the sociodemographic information, tobacco use, diet, general health status, functional health status, physical activity, access to and utilization of health care, oral health, history of chronic conditions, inventory of medications for chronic conditions, and miscellaneous health behavior. Physical examination such as anthropometry, respiration, heart rate, and blood pressure was recorded as part of the survey. Biochemical measurements such as fasting lipid profile, hemoglobin A1c, and vitamin D levels were done at the local clinic. Informed written consent was obtained from all participants before the survey started, and data confidentiality was maintained.

In the individual questionnaire the assessment of NCDs like asthma, MI and stroke were done by asking questions regarding the health status in last 30 days from the day of interview. Asthma was assessed based on response to question “During the past 30 days, have you had wheezing or whistling in your chest?” If the participant’s response yes, then he was considered as having asthma. Similar to this, questions on COPD, MI and stroke were asked and positive response was considered as presence of disease. Such classification was done based on the history given by the past, hence there are chances of misclassification due to reporting bias and ascertainment bias.



The primary outcome variables considered for current study were prevalence of various chronic disease conditions including Myocardial infarction, stroke, chronic kidney diseases, chronic respiratory conditions like Asthma etc. The risk factors for these chronic conditions including smoking, diabetes, hypertension etc. were considered as secondary outcomes of interest for analysis. Gender and Age group were considered as explanatory variables.

Data was analyzed by descriptive analysis using frequency and proportions for categorical variables, mean and standard deviation (SD) for numeric variables. The association of gender and age group with NCDs/ NCD risk factors was assessed by cross-tabulation and percentages. Chi square test was used to test statistical significance. P value < 0.05 was considered statistically significant. For statistical analysis, IBM SPSS software of version 22 was used [11].

RESULTS

A total of 10195 respondents aged 15 to 101 were added to the study. The mean age of respondents was 37.9 years (SD 16.1), of which females (51.5%) slightly outnumber male. The proportion of currently married individuals was 65.0%, 28% of them had completed their high school and 29% of the population were government employees. Income estimate was 7,000 riyals to 10,000 riyals among 16.2% of the population.

Asthma was the most common NCD observed among 372(3.65%) of the population, followed myocardial infarction among 68 (0.5%) people. Stroke and renal failure were observed among 55 (0.5X%) and 49 (0.5X%) respectively. The most common non-communicable disease observed in the study sample was asthma (3.6%), whereas the most common NCD risk factor was smoking.

Most of the NCD risk factors and NCDs were found higher in males than females except for cancer, which was found higher in females. Among NCD risk factors, smoking was found higher in the age group 31 to 45 years and 46 to 60 years; prediabetes Mellitus was found higher in 46 to 60 years, diabetes mellitus, hypertension, and hypercholesterolemia were found higher in the age group >60 years. All the NCDs (stroke, myocardial infarction, congestive heart failure, atrial fibrillation, asthma, COPD, renal failure, and cancer) were higher in the age group >60 years.

Table 1. Demographic characteristics of the respondents (N=10195)

Background characteristics		Frequency	Percentage
Sex	Female	5252	51.52%
	Male	4943	48.48%
Age group	15 to 30 years	3866	37.92%
	31 to 45 years	3508	34.41%
	46 to 60 years	1807	17.72%
	>60 years	1014	9.95%
Education	Can read and write	658	6.45%
	Can't read or write	1373	13.47%
	College / University completed	2256	22.13%

	High school completed	2874	28.19%
	Intermediate school completed	1715	16.82%
	Post graduate degree	148	1.45%
	Primary school completed	1083	10.62%
	Technical training	88	0.86%
Marital status	Currently married	6623	64.96%
	Never married	2733	26.81%
	Widowed	515	5.05%
	Divorced	210	2.06%
	Separated	114	1.12%
Parent relationship	Not related	4961	48.66%
	First-degree cousins	2181	21.39%
	Second-degree cousins	1877	18.41%
	Other relation between them	1176	11.54%
Work status	Government employee	2955	28.98%
	Homemaker	2510	24.62%
	Student	1805	17.70%
	Unemployed (able to work)	906	8.89%
	Retired	758	7.44%
	Non-government employee	430	4.22%
	Unemployed (unable to work)	426	4.18%
	Self-employed	384	3.77%
	Non-paid	21	0.21%
Income estimate	Less than 3,000 Riyals	1491	14.62%
	3,000 Riyals to less than 5,000 Riyals	1604	15.73%
	5,000 Riyals to less than 7,000 Riyals	1419	13.92%
	7,000 Riyals to less than 10,000 Riyals	1647	16.15%
	10,000 Riyals to less than 15,000 Riyals	1399	13.72%
	15,000 Riyals to less than 20,000 Riyals	654	6.41%
	20,000 Riyals to less than 30,000 Riyals	253	2.48%
	30,000 Riyals or more	200	1.96%
	No income	1528	15.00%

Table 2: NCD and NCD risk factors (N=10195)

NCDs/NCD risk factors	Frequency	Percentage
NCDs		
Asthma	372	3.65%
Myocardial infarction	68	0.67%
Stroke	49	0.48%
Renal failure	55	0.54%
Congestive Heart failure	41	0.40%
Atrial fibrillation	38	0.37%
COPD	27	0.26%
Cancer	25	0.25%
NCD risk factors		
Smoked tobacco ever	1734	17.01%
Smoke tobacco currently	1302	12.77%
Diabetes mellitus	1162	11.40%
Hypertension	956	9.38%
Hypercholesterolemia	718	7.04%
Pre Diabetes mellitus	194	1.90%

Table 3. NCD and NCD risk factors according to gender (N=10195)

NCDs/NCD risk factors	Female (n=5252)	Male (n=4943)	P-value
NCDs			
Asthma (n=372)	173(3.29)	199(4.03)	0.049
Myocardial infarction (n=68)	17(0.32)	51(1.03)	<0.001
Renal failure (n=55)	20(0.38)	35(0.71)	0.024
Stroke (n=49)	18(0.34)	31(0.63)	0.038
Congestive Heart failure (n=41)	14(0.27)	27(0.55)	0.026
Atrial fibrillation (n=38)	19(0.36)	19(0.38)	0.851

COPD (n=27)	10(0.19)	17(0.34)	0.132
Cancer (n=25)	18(0.34)	7(0.14)	0.040
NCD risk factors			
Smoked tobacco ever (n=1734)	121(2.3)	1613(32.63)	<0.001
Smoke tobacco currently (n=1302)	94(1.79)	1208(24.44)	<0.001
Diabetes mellitus (n=1162)	522(9.94)	640(12.95)	<0.001
Pre Diabetes mellitus (n=194)	96(1.83)	98(1.98)	0.568
Hypertension (n=956)	462(8.8)	494(9.99)	0.038
Hypercholesterolemia (n=718)	306(5.83)	412(8.34)	<0.001

Table 4: Distribution of NCDs and NCD risk factors across different age groups (N=10195)

NCDs/NCD risk factors	15 to 30 (n=3866)	31 to 45 (n=3508)	46 to 60 (n=1807)	>60 (n=1014)	P-value
NCDs					
Asthma (n=372)	130(3.36)	117(3.34)	72(3.98)	53(5.23)	0.022
Myocardial infarction (n=68)	0(0.00)	12(0.34)	18(1.00)	38(3.75)	<0.001
Renal failure (n=55)	3(0.08)	9(0.26)	16(0.89)	27(2.66)	<0.001
Stroke (n=49)	5(0.13)	12(0.34)	9(0.50)	23(2.27)	<0.001
Congestive Heart failure (n=41)	2(0.05)	9(0.26)	12(0.66)	18(1.78)	<0.001
Atrial fibrillation (n=38)	7(0.18)	13(0.37)	9(0.50)	9(0.89)	0.008
COPD (n=27)	3(0.08)	5(0.14)	8(0.44)	11(1.08)	<0.001
Cancer (n=25)	3(0.08)	9(0.26)	7(0.39)	6(0.59)	0.014
NCD risk factors					
Smoked tobacco ever (n=1734)	517(13.37)	703(20.04)	363(20.09)	151(14.89)	<0.001
Smoke tobacco currently (n=1302)	427(11.05)	551(15.71)	261(14.44)	63(6.21)	<0.001
Diabetes mellitus (n=1162)	41(1.06)	206(5.87)	477(26.40)	438(43.20)	<0.001
Pre-Diabetes mellitus (n=194)	11(0.28)	54(1.54)	86(4.76)	43(4.24)	<0.001
Hypertension (n=956)	28(0.72)	169(4.82)	368(20.37)	391(38.56)	<0.001
Hypercholesterolemia (n=718)	24(0.62)	185(5.27)	285(15.77)	224(22.09)	<0.001

Note: Simulated p-value was calculated in case of 0 in any of the cell count

Asthma, myocardial infarction, renal failure, stroke, congestive heart failure were found statistically significantly higher in males as compared to females ($p < 0.05$). Meanwhile, cancer was statistically significantly found higher in females as compared to males ($p<0.05$). There was no statistically significant difference in proportion of atrial fibrillation and COPD between males and females ($p > 0.05$). Proportion of those who smoked tobacco ever and those who smoke tobacco currently were found statistically significantly higher in males as compared to females ($p<0.05$). Similarly, diabetes mellitus, hypertension and hypercholesterolemia were found statistically significantly higher in males as compared to females ($p<0.05$). However, there was no statistically significant difference in proportion of pre-diabetes mellitus between males and females ($p>0.05$). (Table 3)

There was statistically significant association found between NCDs (asthma, myocardial infarction, renal failure, stroke, congestive heart failure,atrial fibrillation, COPD, cancer) and age group ($p<0.05$). There was increase in proportion of diseases (myocardial infarction, renal failure, stroke, congestive heart failure,atrial fibrillation, COPD and cancer) with the increase in age group; the lowest proportion was found in age group 15 to 30 years whereas the highest proportion was found in the age group > 60 years. The proportion of asthma was almost similar for age group 15 to 30 years and 31 to 45 years; however, the proportion increased in the age group 46 to 60 years and > 60 years.

Similarly, there was statistically significant association found between NCD risk factors (smoked tobacco ever, smoke tobacco currently, diabetes mellitus, pre-diabetes mellitus, hypertension, hypercholesterolemia) and age group ($p<0.05$). Proportion of those who smoked tobacco ever was found higher in age group 31 to 45 years and 46 to 60 years as compared to age group 15 to 30 years and >60 years. Among the age group > 60 years, proportion of those who smoke tobacco currently was significantly less as compared to other age groups. There was increase in proportion of diabetes mellitus, hypertension and hypercholesterolemia with the increase in age group; the lowest proportion was found in age group 15 to 30 years whereas the highest proportion was found in the age group > 60 years. The proportion of pre-diabetes mellitus was found lowest in age group 15 to 30 years whereas it was found highest in the age group 46 to 60 years. (Table 4)

DISCUSSION

This secondary analysis of SHIS 2013 survey data revealed most common non-communicable disease in the study sample was asthma (3.65%), whereas the most common NCD risk factor among the respondents was smoking. Most of the NCD risk factors and NCDs were found higher in males than females except for cancer, which was found higher in females. This type of profile is similar to various other past studies done in Eastern Mediterranean Region [12–15]. The mean age of the study sample was 37.9 years (SD 16.1), and most of them were females. Age above 35 years is at increased risk of developing NCDs and various risk factors [3]. Among NCD risk factors, smoking was higher in the age group 31 to 45 years and 46 to 60 years. The overall prevalence of tobacco smoking in Saudi Arabia as per the 2015 estimate was 12.4% [16]. Similar to this ob-

servation, in this current study also the prevalence was 12.8%. This high prevalence of smoking can be attributed to cause asthma among the study population.

In the current study, the prevalence of hypertension was 9.4%. It was higher among males and those above 60 years of age. Hypertension is the leading cause of disability and mortality in Saudi Arabia amongst cardiovascular diseases. On average, high blood pressure affects 15.2% of the Saudi Arabian population, majority 40.5% of the population, is at borderline status. The prevalence of hypertension increases with age, and it becomes 65.2% for the population above 65 years [5,17,18].

This study findings show that there is a gender based difference in the prevalence of NCDs. There was a statistically significant difference in the prevalence of MI between males (1.03%) and females (0.32%). Similarly, in for other NCDs also there was male preponderance. This gender differences were similar to other studies done in Saudi Arabia[13,15][19]. This differences can be attributed to the varied behavioural risk factors among gender. There was statistically significant difference between the prevalence of NCD risk factors between males and females. Males had high prevalence of tobacco smoking, diabetes mellitus and hypercholesterolemia compared to females. When considering the age distribution, the prevalence of NCDs was high among participants above the age of 60 yrs. However, there is a considerable shift in age distribution towards the young age also. Among people with asthma, 117(3.34) were in the age group of 31 to 45 years. MI, stroke and COPD were also high in this age group 12(0.34), 12(0.34), 5(0.14) respectively. This show a shift in the prevalence of NCDs among young adult population. Such shift can be attributed to increase in behavioural risk factors among them.

In this study, the most prevalence NCD among the Saudi population was asthma (3.65%). In a study conducted using the European Community Respiratory Health Survey (ECRHS) questionnaire for asthma assessment among Saudi population in Riyadh, showed that the prevalence of asthma among adults was 11.3%. Comparing this with other European countries, 5.8-6.8% in Sweden, 2.1-4.4% in Germany, 3.5-5.5% in France, 7.5-8.4% in England, 2.9% in Greece, 3.3-4.5% in Italy and 2.1-6.3% in Spain[20]. This high prevalence in these studies might be due to more objective assessment using structured and validated questionnaire. In the current study, no such questionnaire has been used and the prevalence was determined based on self-reported health status. This would have resulted in recall or reporting bias leading to under or overestimate of the burden.

Diabetes is growing fast to attain its epidemic status in Saudi Arabia; more than 3 million people are currently diagnosed with the disease. As per 2013 estimates, 1 in 3 people are either diabetic or pre-diabetic. It is predicted that by 2030, diabetes mellitus may affect up to 4.5 million individuals in the kingdom [5,17,18]. This profile is reflected in the current study also. The prevalence of diabetes and prediabetes among the study population was 11.4% and 1.9%, respectively. Stroke, myocardial infarction, congestive heart failure, atrial fibrillation, asthma, COPD, renal failure, and cancer were the other common NCDs observed. The prevalence of these was high among populations aged above 60 years.

The limitation of this study is that it is a secondary data analysis from the SHIS dataset. Few NCDs such as asthma, COPD and stroke were assessed through self-reported health condition of the participants by answering questions in individual module. Hence, there are chances of recall bias, reporting bias and ascertainment bias. The response rate of patients reporting to the clinic for lab investigations was low (55%), this might have led to selection bias due to selective reporting by at risk elderly population to the clinic for blood investigations.

CONCLUSIONS

In conclusion, this study adds evidence to the NCD burden in Saudi Arabia. The NCD risk factors such as smoking were high among males. Both the risk factors and the prevalence of non-communicable diseases were high among people aged more than 60 years. Hence, prevention strategies, screening, and early interventions should be focused on the high-risk group.

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Informed Consent Statement: Not applicable.

Data Availability Statement: This study was secondary data analysis from data available at http://www.healthdata.org/ksa/projects/saudi-health-interview-survey

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