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Original Article

Primary care physicians' knowledge, attitudes and practices related to metabolic syndrome screening and management in Alahsa, Saudi Arabia

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ABSTRACT

Background: The metabolic syndrome (Metabolic syndrome) is a cluster of the most dangerous risk factors for type 2 diabetes mellitus and cardiovascular diseases (CVD), two of the main causes of morbidity and mortality worldwide, which include hyperglycemia, abdominal obesity, lipid abnormalities and high blood pressure.
Study design: a cross-sectional descriptive study.
Results: A predominant number (94.1%) knew what constitutes MS. However, merely more than a quarter of the participant (28%) knew correctly the serum LDL cutoff value for the diagnosis of MS according to IDF criteria. The aim of lipid lowering treatment was known by slightly more than three fourth (78%) of the participants. Two third also knew the target of antihypertensive therapy. More than two third (69.5%) were also aware that waist circumference is one of the criteria for diagnosis of Metabolic syndrome.
Conclusion: There is a need to increase the awareness of MS among the PHC Physicians. More training programs need to be planned. A better awareness among primary care physician is warranted for an early diagnosis and effective management of MS in Saudi Arabia.

1. Introduction

1.1. Background

1.1.1. Definition metabolic syndrome

The metabolic syndrome (MS) is a cluster of the most dangerous risk factors for type 2 diabetes mellitus and cardiovascular diseases (CVD), two of the main causes of morbidity and mortality worldwide, which include hyperglycemia, abdominal obesity, lipid abnormalities and high blood pressure [1,2].

There are several definitions for metabolic syndrome, the National Cholesterol Education Program – Third Adult Treatment Panel (NCEP ATPIII) is the most widely used in the literature [5]. The others commonly used definitions were written by the World Health Organization (WHO) and the International Diabetes Foundation (IDF) [4].

ATP III metabolic syndrome developed by the 2001 NCEP Adult Treatment Panel III criteria were updated in 2005 from the American Heart Association (AHA)/National Heart, Lung, and Blood Institute (NHLBI) [6].

"Current ATP III criteria define the metabolic syndrome as the presence of any three of the following five traits [7,8]:

Abdominal obesity, defined as a waist circumference in men ≥102 cm and in women ≥88 cm.

- Serum triglycerides ≥150 mg/dL or drug treatment for elevated triglycerides
- Serum high-density lipoprotein (HDL) cholesterol <40 mg/dL in men and <50 mg/dL in women or drug treatment for low HDL cholesterol
- Blood pressure ≥130/85 mmHg or drug treatment for elevated blood pressure
- Fasting plasma glucose (FPG) ≥100 mg/dL or drug treatment for elevated blood Glucose"

The International Diabetes Federation (IDF) updated their metabolic syndrome criteria in 2006 as follow [1]:

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Central obesity (defined as waist circumference with ethnicity-specific values) plus any two of the following four factors.

- Triglycerides ≥150 mg/dL or treatment for elevated triglycerides
- HDL cholesterol <40 mg/dL in men or <50 mg/dL in women, or treatment for low HDL.
- Systolic blood pressure ≥130, diastolic blood pressure ≥85, or treatment for hypertension.
- FPG ≥100 mg/dL or previously diagnosed type 2 diabetes; If above 100 mg/dL, oral glucose tolerance test(OGTT) is strongly recommended but is not necessary to define the presence of the syndrome**".**

1.1.2. Prevalence of metabolic syndrome

The prevalence of MS is around 20–25% of the world's adult population [1]. The prevalence of metabolic syndrome in Saudi Arabia was reported over period between 2007 and 2009 according to the ATP III criteria and it's about 39.9% [20]. The other study in Saudi Arabia was reported over a 5-year period between 1995 and 2000 and it's about 39.3% [3].

1.1.3. Consequences of metabolic syndrome

Individuals with MS are three times as likely to have a heart attack or stroke compared with people who don't have the metabolic syndrome. In addition, they have fivefold greater risk of developing type 2 diabetes [1].

1.1.4. Management of metabolic syndrome

Aggressive lifestyle intervention with weight reduction and increased physical activity is considered the primary therapy for the management of patients with metabolic syndrome [9]. The Diabetes Prevention Program stated that vigorous lifestyle intervention in an individual with metabolic syndrome might decrease the rate of developing diabetes by more than 50% (from 11 to 4.8%) [10].

Pharmacological treatment should be considered for those patients who do not show adequate response to lifestyle changes [11]. Early diagnosis of patients with metabolic syndrome and the selection of an appropriate treatment protocol is important in both controlling and reducing the risk of CVD [12]. Assessment of 10-year risk for CVD by using a risk assessment algorithm, such as the Framingham Risk Score, is useful in the assessment of individuals who need for medical intervention to lower blood pressure and cholesterol [9].

A thorough literature review revealed that no one study have been conducted in Al Ahsa about metabolic syndrome and evaluation of knowledge, attitudes, and practices among PHC physicians**.** About eight studies concerning MS found, seven are International studies, and one local studies in KSA.

1.1.4.1. International studies. In a study conducted in the United States of America (USA) in 2008.The study results that primary care physicians have a deficit in the management of cardiovascular risks based on guideline recommendations [13].

Moreover, two studies published in México. The first one was done in 2008 that aims to measure family physicians' clinical Attitude for the diagnosis and treatment of metabolic syndrome and found there is a limitation of family physicians to identify and manage metabolic syndrome [14]. The other study published in 2015 that aims to identify the health professionals knowledge and ability to diagnose children and adolescents with metabolic syndrome and found that despite that most of these professionals reported knowledge of the criteria for metabolic syndrome diagnosis in children and adolescents they do not know the parameters and cutoff points for metabolic syndrome diagnosis [15].

One more study was done in Croatia in 2010 that aims to identify physicians' knowledge and perception of CVD risk factors and perceived implementation of CVD prevention guidelines as well as barriers to their implementation. The study result in most physicians believe that guidelines are useful but only half of them using some guidelines where most of them use their experience. In addition, they have unsatisfactory knowledge about guidelines [16].

Another study published in Nigeria in 2014 that aims to identify physician's knowledge and pattern of treatment of metabolic syndrome. The study results in that all physicians who attend continuous medical education program had knowledge about metabolic syndrome but only almost half of them were treated patient based on guidelines. In addition despite that majority of physicians who not attend a continuous medical education program had knowledge about metabolic syndrome, only minority of them treated patient based on guideline [17].

Moreover, a study conducted in Australia in 2016 that aims to identify psychiatric practice of screening for metabolic syndrome in the patient who use antipsychotic drugs. The study result in that majority of Australian psychiatrists inadequately screen for metabolic syndrome among patient who uses antipsychotic agents where the minority of them do not know who to screen for metabolic syndrome [18].

1.1.4.2. Studies in KSA. Study published in Makkah, Saudi Arabia in 2014 that aim to estimate knowledge, attitude, and practices about metabolic syndrome of primary health care physicians. The study result in (38.7%) of the participant was above the age of 40. More than half of them (56.60%) have Bachelor of Medicine, Bachelor of Surgery (MBBS) degree, while (8.49%) have a diploma degree in family medicine. Around (13.21%) have Master degree in different specialties where about (17.92%) certified family medicine board and only (3.77%) have Membership of the Royal College of General Practitioners (MRCGP). Most of physicians 79 (74.5%) were aware of the proper definition of metabolic syndrome. Contrary to that, most of them (74.5%) were not aware of the age-adjusted prevalence of metabolic syndrome in Kingdom of Saudi Arabia (KSA) and (77.4%) of them were not aware of the metabolic syndrome diagnosis according to International Diabetic Foundation criteria. Most of the physicians (75.5%) disagreed that metabolic syndrome diagnosis is difficult to be made at primary health care centers (PHCC) at Makkah. Slightly more than half of the physicians (55.6%) agreed that patients with metabolic syndrome should be managed by specialists. Around (78.3%) and (63.2%) of the physicians were confident to diagnose and manage metabolic syndrome respectively. The majority of the participants were agreed that they should know more about metabolic syndrome (89.6%) and attend training courses about metabolic syndrome (87.7%). Only (12.3%) of the physicians reported a history of attending training courses about metabolic syndrome. As the conclusion, the participant had insufficient knowledge about diagnosis and management of metabolic syndrome despite that majority of them were aware of it [19].

1.2. Rationale

- The consequences of metabolic syndrome are serious, which could be prevented by applying guideline therapy
- The study will conduct in AlAhas, where there is no previous relevant studies conduct.

1.3. Research hypothesis

Limitation of family physicians to identify and manage metabolic syndrome in PHCCs in Al-Ahsa, Saudi Arabia.

1.4. Objectives

1.4.1. General objective

To assess the level of knowledge, attitude and practice of metabolic syndrome among primary health care physician's in Al-Ahsa region, Saudi Arabia.

1.4.2. Specific objectives

To describe the variables that affect attitude of PHC physicians in approaching metabolic syndrome patients.

2. Methodology

2.1. Study area

It will be held on primary health care centers in Al-Ahsa that is the largest governorate in Saudi Arabia's Eastern province, Al-Ahsa represents 68% of the eastern region and 24% of the total kingdom.

The four major cities in Al-Ahsa are Mubarraz, Hofuf, Al-Oyoun and Al-Omran, in addition to Eastern villages, Northern villages and Desert villages. It is of great importance as it is home to the largest oil fields with an area of 379,000 square km, with a population of about 1,800,000 people. Recently, it is the first city from the gulf included in the UNESCO's World Heritage List in 2018. Al-Ahsa has been chosen as the capital of Arab tourism for 2019.

2.2. Study period

Period of the study will be during the academic year 2018–2019.

1 Preparatory period (4–8 weeks)
- Selecting the title and doing the literatures review
- Taking the permission
- Preparing the questionnaire
- Pilot study

2 Fieldwork (12–15 weeks)
- Data collection
- Data entry and analysis

3 Writing the report (2–4 weeks)

2.3. Study settings

The study will be conducted in the MOH PHCCs in Al-Ahsa, KSA.

2.4. Study description

2.4.1. Study type

A cross-sectional descriptive study.

2.4.2. Study population

Primary health care physicians working in the PHCCs of the ministry of health in AlAhsa region, at the period of the study.

2.4.3. Population selection criteria

2.4.3.1. Inclusion criteria

- Male & female
- All nationalities
- All permanently work physicians in the PHCCs who are involved directly in patient care in Al Ahsa, Saudi Arabia during the study time, Including general practitioner, family medicine, pediatric, Obstetrics and Gynecology, and interns, apart from dental care and other specialties, will be rolled in.

2.4.3.2. Exclusion criteria

- Physicians who will be included in the pilot study.
- The investigator, supervisor and persons who will be involved in the validation of the questionnaire.
- Physicians who works in outskirts PHCCs or on vacation.
- Any physician who is not involved directly in clinical patient's care as whom in administration,Dentists and rotating doctors Will be excluded from the study.

2.4.4. Sample size

The study population is the total number of physicians in the following specialties (general practitioner, family medicine, pediatric, Obstetrics and gynecology) physicians working in PHCCs of Al-Ahsa in MOH sectors. According to the Public Health Employee Affairs Database, 147 physicians will be eligible after exclusion.

The sample confidence level is 95% with confidence interval of 5%, so the estimated sample size will be 107 and to increase the response rate we will add 20% extra to the sample size, which make the final sample size of 118 physicians.

For this calculation, the sample size calculator in the National Statistical Service website is used (Creative Research System) https://www.surveysystem.com/sscalc.htm.

2.5. Study variables

2.5.1. Dependent variables

Knowledge, attitude and Practice scores of PHC physicians in approaching metabolic syndrome patients.

2.5.2. Independent variables

Socio-demographic including (Age, Sex, Nationality).

- Place of graduation
- Years of experience
- Academic Qualification
- Specialty and Training center

2.6. Sampling technique

To have a realistic and representative sample, multistage stratified sampling from the whole sectors of PHCCs in Al Ahsa will be done. Proportionately & randomly, The PHCC will be chosen from each sector. At PHCC, physicians will be selected randomly by using alphabetical order in each center.

2.7. Data collection tool

Self-administered pilot -tested and validated questionnaire will be used. The questionnaire was used in the study (PRIMARY HEALTH CARE PHYSICIAN'S KNOWLEDGE, ATTITUDE

AND PRACTICE ABOUT METABOLIC SYNDROME IN MAKKAH CITY) at 2016. Correspondence to: YUSUF AHMED M ALHARBI, SBFM.

Senior registrar of Family Medicine, Al-Eskan primary health care center, Makkah, Saudi Arabia, the research was published in American Journal of Research Communication http://www.usa-journals.com/

The consent was taken from the author. Some modifications were done in the questionnaire to suit the local health care system. After modification, the validity and reliability of the questionnaire will be retested through a pilot study.

The questionnaire will consist of four main parts:

1) Socio-demographic data,
2) Questions to assess the knowledge regarding metabolic syndrome
3) Questions to assess attitude regarding metabolic syndrome
4) Questions to assess the practice regarding preventive and clinical aspect in approaching metabolic syndrome.

2.8. Data collection technique

We will distribute the questionnaire during the working hours; and will make sure to not disturb the physicians during the time of their work.

The researcher will be available to clarify any issue, then questionnaires will be collected on the same day.

This will be done over three month's period.

2.9. Data analysis

- Data will be collected, checked for completeness, and verified for inconsistency or outlier readings, Then Data will be entered by investigators into a personal computer and analyzed by Statistical Package for the Social Sciences (SPSS) software version 21. All variables of the questionnaire will be coded before entry, checked for accuracy and scrutinized before analysis.
- Continuous variables were presented as mean and standard deviation (SD). Categorical variables will be presented as frequency and percentage and continuous data (like age, years of graduation) will be grouped in categorical data.
- All categorical data will be crosstabs with sociodemographic data and chi-square will be used to test for association, and used to compare 2 or more qualitative variables, Student's *t*-test to compare 2 independent quantitative variables and ANOVA test to compare more than 2 independent quantitative variables. Later, Logistic regression will be used to manage any effect of cofounder. We will use a histogram presentation to illustrate some items response in the questionnaire. Other appropriate statistical tests will be used as indicated.
- Significance will be determined at p-value < 0.05 and Confidence interval of (95%CI). This well be done with the assistance of a statistical advisor.

2.10. Pilot study

- A pilot study will be conducted in one PHCCs to test the validity of the questionnaire.
- Modifications will be done according to the pilot results.
- All pilot study records will be excluded from the study sample.

2.11. Ethical consideration

- After the approval of the study by the local ethics committee and before conducting the study, written permission from the Joint Program of Family Medicine & from the higher authorities in the ministry will be obtained.
- Permission of all the PHC managers will be obtained.
- Verbal consent will be taken from each participant.
- For data collection. The individual consent from each to participate in the study is a prerequisite.
- All information will be kept confidential and will not be accessed except for the purpose of scientific research.

In all the research steps, Ethics will be considered.

2.12. Difficulties

- There might be a limitation in the time.
- Low response or absence of some physicians.

2.13. Budget

It will be self-funded.

3. Results

One hundred and eighteen Primary Healthcare Physicians were enrolled in this study. The subjects comprised Physicians with varied backgrounds. Sociodemographic variables of the study population are shown in Table 1. Majority were Saudis, though nearly one third (31.4%) were from other nationalities. Men outnumbered the women (61% vs. 39%) as shown in Fig. 1. The subjects were mostly General Physicians (60.2%), followed by Family Physicians (27.1%). The rest were specialists like Obstetrician −Gynecologists, Pediatricians and Internal Medicine. Most of them were MBBS graduates (66.1%) or with Diploma (19.5%).

3.1. Knowledge

Assessment of the knowledge regarding MS was done through five questions, each having three options: True, False and I don't

Table 1
Descriptive analysis for Socio-demographic characteristics (n = 118).

Demographic		Frequency	Percent
Sex	Male	72	61.0
	Female	46	39.0
Nationality	Saudi	81	68.6
	Non-Saudi	37	31.4
Marital status	Single	20	16.9
	Married	96	81.4
	Widowed	2	1.7
Graduation place	outside KSA	46	39.0
	inside KSA	72	61.0
Specialty	FM	32	27.1
	GP	71	60.2
	Ob/Gyn	8	6.8
	Pediatric	4	3.4
	Internal medicine	1	.8
	others	2	1.7
Highest qualification degree	MBBS	78	66.1
	Diploma	23	19.5
	Master	11	9.3
	Board	4	3.4
	Ph.D	2	1.7

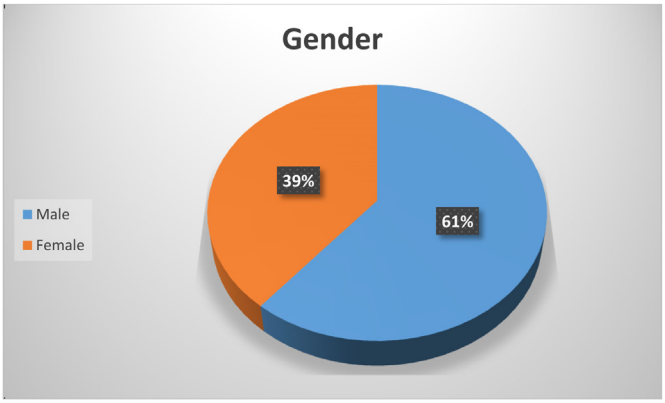

Fig. 1. Distribution of study sample by gender.

know (Table 2). A predominant number (94.1%) knew what constitutes MS. However, merely more than a quarter of the participant (28%) knew correctly the serum LDL cutoff value for the diagnosis of MS according to IDF criteria. The aim of lipid lowering treatment was known by slightly more than three fourth (78%) of the participants. Two third also knew the target of antihypertensive therapy. More than two third (69.5%) were also aware that waist circumference is one of the criteria for diagnosis of MS.

The mean knowledge score was 3.35 ± 1.04. Slightly more than half (51.7%) had low knowledge level. The remaining knew well about the different aspects of MS.

To compare the mean knowledge score of more than two independent variables, we used ANOVA, as shown in Table 3. The mean knowledge score was significant with regards to specialty in favor of the Family Physicians. There was no significant difference among other variables.

Student *t*-test was used to analyze mean knowledge score of two independent variables (Table 4). Females had better knowledge than the males (p value 0.001). There was no other significant difference.

The association of categorical data with independent variables was evaluated by chi-square test (Table 5). A significant association of knowledge regarding primary aim of using lipid lowering agents and waist circumference as a criteria for diagnosis of MS was observed among different g enders. Female Physicians were expected to know be more aware regarding these two points than their male counterparts (p value 0.04 and 0.013 respectively). No significant association of gender was observed with attitude towards MS.

The knowledge of increased waist circumference as a criterion for diagnosis for MS was significantly associated with No-Saudi Physicians (p value 0.022). Similarly, the Non-Saudi Physicians were more confident to manage the MS (p value 0.019). However, with regards to the practices a stronger association was observed in favor of Saudi Physicians.

Marital status had no influence on the knowledge and attitude of MS. However, the married Physicians were expected to have a better idea about management of MS.

The place of education had no bearing on the knowledge, attitude or practice domains. However, specialty had some impact. The Family Physicians were better aware about the targeted blood pressure reduction by antihypertensive drugs in patients with established diabetes (p value 0.049). They were also more likely to manage the patient with MS (p value 0.035). However, the management of MS patients with education, diet advice, exercise advice and medication was more strongly associated with GPs.

Physician's qualification was significantly associated with management of MS. Management of MS through education, diet advice, exercise advice and medication.

3.2. Attitude

Six items were included in the questionnaire to assess the attitude towards MS. Five options were provided ranging from Strongly Agree to Strongly Disagree (Table 6). Nearly half of the respondents (48.3%) agreed that regular screening for the diagnostic parameters of MS has to be undertaken for early detection of MS. A further 35.6% strongly agreed on this point. A considerable number either agreed or strongly agreed (57.6% and 28% respectively) that management of MS is generally effective. Similarly a large number of participants were also confident to diagnose and manage MS. More than two third felt that they should know more about MS. Almost an equal number expressed that they need to attend training.

Table 2
Respondents knowledge regarding MS.

		N	%	Correct answer
Metabolic Syndrome is a component of central obesity, dyslipidemia, increased blood pressure and impaired blood glucose level	True	111	94.1	94.10%
	False	4	3.4	
	Idk	3	2.5	
	Total	118	100.0	
According to IDF (international diabetic foundation) 2005,LDL > 130 mg/dl is considered one of the criteria For diagnoses of metabolic	True	53	44.9	28%
	False	33	28.0	
	Idk	32	27.1	
	Total	118	100.0	
The Primary aim of management with the lipid lowering agent if indicated, is lowering TG alone	True	21	17.8	78%
	False	92	78.0	
	Idk	5	4.2	
	Total	118	100.0	
In patient with established diabetes, antihypertensive therapy goal to keep blood pressure less than 140-90 mmhg (based on JNC 8)	True	78	66.1	66.10%
	False	33	28.0	
	Idk	7	5.9	
	Total	118	100.0	
Increased waist circumference (specific population) is consider a necessary criteria for diagnosis of metabolic syndrome	True	82	69.5	69.50%
	False	20	16.9	
	Idk	16	13.6	
	Total	118	100.0	

Table 3
ANOVA results for the difference in Knowledge score means among demographic data.

		N	Mean	Std. Deviation	F	P value
marital status	Single	20	3.3500	.87509	.118	.888
	Married	96	3.3646	1.08695		
	Widowed	2	3.0000	.00000		
	Total	118	3.3559	1.04207		
Specialty	FM	32	3.8750	.87067	2.418	.040
	GP	71	3.1549	1.09084		
	Ob/Gyn	8	3.3750	.74402		
	Pediatric	4	3.0000	.81650		
	Internal medicine	1	3.0000	.		
	Others	2	3.0000	1.41421		
	Total	118	3.3559	1.04207		
Highest qualification degree	MBBS	78	3.2564	1.09824	1.952	.107
	Diploma	23	3.4783	.89796		
	Master	11	3.5455	.82020		
	Board	4	4.5000	.57735		
	Ph.D	2	2.5000	.70711		
	Total	118	3.3559	1.04207		

Table 4
T test results for the difference in knowledge score means in demographic data.

		N	Mean	Std. Deviation	t	df	P value
Sex	Male	72	3.0694	1.11742	−3.96	116	0.00013
	Female	46	3.8043	.71863			
Nationality	Saudi	81	3.2469	1.12395	−1.69	116	0.09278
	Non-Saudi	37	3.5946	.79790			
Graduation place	outside KSA	46	3.4348	.88574	0.65	116	0.51351
	inside KSA	72	3.3056	1.13384			

Table 5
The relationship between study variables and knowledge, attitude, and practice.

Study variables	Gender		Nationality		Marital status		Graduation place		Specialty		Highest qualification degree	
	X^2	P-value	X^2	P-value	X^2	P-value	X^2	P-value	X^2	P-value	X^2	P-value
Metabolic Syndrome is a component of central obesity, dyslipidemia, increased blood pressure and impaired blood glucose level	2.35	.307	1.5	.471	1.7	.790	2.14	.343	2.77	.986	2.32	.970
According to IDF (international diabetic foundation) 2005,LDL > 130 mg/dl is considered one of the criteria For diagnoses of metabolic	2.06	.356	1.89	.388	3.36	.500	0.26	.875	11.77	.300	8.33	.402
The Primary aim of management with the lipid lowering agent if indicated, is lowering TG alone	6.43	.040	2.72	.256	8.28	.082	3.38	.184	15.11	.128	4.28	.831
In patient with established diabetes, antihypertensive therapy goal to keep blood pressure less than 140-90 mmhg (based on JNC 8)	5.38	.068	0.7	.704	8.77	.067	1.43	.489	18.36	.049	5.56	.696
Increased waist circumference (specific population) is consider a necessary criteria for diagnosis of metabolic syndrome	8.68	.013	7.65	.022	1.26	.868	4.05	.131	10.23	.420	8.49	.386
Screening for diabetes mellitus, hypertension, dyslipidemia should be done on regular basis to early detect metabolic syndrome	0.91	.923	2.82	.588	12.44	.132	5.83	.211	7.53	.995	8.59	.929
Management of metabolic syndrome generally is effective	8.5	.075	1.42	.839	7.18	.517	4.39	.356	37.64	.010	12.45	.712
I am confident to diagnose patient with metabolic syndrome	6.14	.189	11.84	.019	14.42	.071	4.18	.381	27.61	.119	21.38	.164
I am confident to manage patient with metabolic syndrome	4.32	.364	2.46	.651	5.79	.671	1.19	.880	25.73	.175	15.28	.504
I feel that I should know more about metabolic syndrome	4.2	.379	4.26	.371	7.32	.502	1.31	.858	7.18	.996	8.27	.940
I think I need to attend training about metabolic syndrome?	1.17	.883	2.48	.647	10.22	.250	2.48	.648	25.13	.196	7.54	.961
Once you diagnose patient with essential hypertension you will screen him/her for metabolic syndrome	2.97	.226	2.96	.227	1.43	.839	1.36	.505	7.07	.718	10.58	.226
Did you manage patient with metabolic syndrome ?	0.02	.883	1.72	.189	1.14	.566	0.29	.588	11.96	.035	10.52	.032
What types of management you did? (Education)	3.28	0.06	5.13	.030	85.2	.000	2.51	.682	47.85	.001	75.7	.000
What types of management you did? (Diet advice)	6.39	0.001	7.67	.001	81.7	.000	1.75	.498	65.6	0.0001	90.2	.000
What types of management you did? (Exercise advice)	5.55	0.01	6.78	.001	28.44	.000	1.24	.360	73.5	0.0001	77.7	.000
What types of management you did? (Medication)	2.77	0.09	7.23	.001	66.14	.000	1.33	.380	66.6	0.0001	64.16	.000
Did you attend any training about metabolic syndrome?	0.21	.642	0.6	.438	0.6	.741	0.21	.642	6.58	.254	6.16	.187

Table 6
Attitudes responses frequencies and percentages towards MS.

Item	Response	N	%
Screening for diabetes mellitus, hypertension, dyslipidemia should be done on regular basis to early detect metabolic syndrome	Strongly Disagree	11	9.3
	Disagree	5	4.2
	Neutral	3	2.5
	Agree	57	48.3
	Strongly Agree	42	35.6
	Total	118	100.0
Management of metabolic syndrome generally is effective	Strongly Disagree	7	5.9
	Disagree	7	5.9
	Neutral	3	2.5
	Agree	68	57.6
	Strongly Agree	33	28.0
	Total	118	100.0
I am confident to diagnose patient with metabolic syndrome	Strongly Disagree	8	6.8
	Disagree	9	7.6
	Neutral	19	16.1
	Agree	62	52.5
	Strongly Agree	20	16.9
	Total	118	100.0
I am confident to manage patient with metabolic syndrome	Strongly Disagree	4	3.4
	Disagree	11	9.3
	Neutral	23	19.5
	Agree	65	55.1
	Strongly Agree	15	12.7
	Total	118	100.0
I feel that I should know more about metabolic syndrome	Strongly Disagree	9	7.6
	Disagree	7	5.9
	Neutral	6	5.1
	Agree	64	54.2
	Strongly Agree	32	27.1
	Total	118	100.0
I think I need to attend training about metabolic syndrome.	Strongly Disagree	8	6.8
	Disagree	7	5.9
	Neutral	8	6.8
	Agree	70	59.3
	Strongly Agree	25	21.2
	Total	118	100.0

4. Demographic and attitude

The association of categorical data with attitude was evaluated by chi-square test (Table 7). Primary aim of using lipid lowering agents and waist circumference as a criteria for diagnosis of MS was observed among different genders. Female Physicians were expected to have attitude regarding these two points than their male counterparts (p value 0.04 and 0.013 respectively). No other significant association of gender was observed with attitude towards MS.

Table 7
Relationship between demographic variables and attitude.

Attitude items	Gender		Nationality		Specialty	
	Chi-square	P-value	Chi-square	P-value	Chi-square	P-value
Metabolic Syndrome is a component of central obesity, dyslipidemia, increased blood pressure and impaired blood glucose level	2.35	.307	1.5	.471	2.77	.986
According to IDF (international diabetic foundation) 2005,LDL > 130 mg/dl is considered one of the criteria For diagnoses of metabolic	2.06	.356	1.89	.388	11.77	.300
The Primary aim of management with the lipid lowering agent if indicated, is lowering TG alone	6.43	.040	2.72	.256	15.11	.128
In patient with established diabetes, antihypertensive therapy goal to keep blood pressure less than 140-90 mmhg (based on JNC 8)	5.38	.068	0.7	.704	18.36	.049
Increased waist circumference (specific population) is consider a necessary criteria for diagnosis of metabolic syndrome	8.68	.013	7.65	.022	10.23	.420
Screening for diabetes mellitus, hypertension, dyslipidemia should be done on regular basis to early detect metabolic syndrome	0.91	.923	2.82	.588	7.53	.995
Management of metabolic syndrome generally is effective	8.5	.075	1.42	.839	37.64	.010
I am confident to diagnose patient with metabolic syndrome	6.14	.189	11.84	.019	27.61	.119
I am confident to manage patient with metabolic syndrome	4.32	.364	2.46	.651	25.73	.175
I feel that I should know more about metabolic syndrome	4.2	.379	4.26	.371	7.18	.996
I think I need to attend training about metabolic syndrome?	1.17	.883	2.48	.647	25.13	.196

Table 8
Practice of study sample of MS.

Practice		n	%
Once you diagnose patient with essential hypertension you will screen him/her for metabolic syndrome	Never	8	6.8
	Sometimes	40	33.9
	Always	70	59.3
	Total	118	100.0
Did you manage patient with metabolic syndrome ?	Yes (move to the next question)	76	64.4
	No (move to question number 4)	42	35.6
	Total	118	100.0
What types of management you did? (Diet advice)	Education	78	66.1
	Diet advice	69	58.5
	Excercise advice	65	55.1
	Medication	61	51.7
Did you attend any training about metabolic syndrome ?	Yes	31	26.3
	No	87	73.7
	Total	118	100.0

The attitude of increased waist circumference as a criterion for diagnosis for MS was significantly associated with No-Saudi Physicians (p value 0.022). Similarly, the Non-Saudi Physicians were more confident to manage the MS (p value 0.019). Specialty had some impact. The Family Physicians were have more attitude about the targeted blood pressure reduction by antihypertensive drugs in patients with established diabetes (p value 0.049).

4.1. Practice

The practice domain was assessed through four items (Table 8). A majority (59.3%) mentioned that they would always screen a patient for MS, in whom essential hypertension is diagnosed. A third (33.9%) mentioned that they would only do it selectively. Slightly less than two thirds of participants (64.4%) said that they had managed MS patients in their practice. Of those managing MS patients, two third (66.1%) did so through education, 58.5% through diet advice, 55.1% through exercise advice and 51.7% with medication. Almost three fourth (73.7%) mentioned that they haven't attended any training regarding MS.

5. Demographic and practice

The association of categorical data with Practice was evaluated by chi-square test (Table 9). Family Medicine were also more likely to manage the patient with MS (p value 0.035). However, the management of MS patients with education, diet advice, exercise advice and medication was more strongly associated with GPs. Female physicians were have more practice regarding type of management they did (diet and exercise devises, p value = 0.001, 0.01 respectively). Furthermore, Saudi physicians were have more practice regarding type of management they did (Education, diet, exercise devises, and medication, p value = 0.03, 0.001, 0.001, 0.001respectively).

6. Discussion

This study was conducted to assess the knowledge, attitude and practices of MS among PHC Physicians in Al-Ahsa governorate of Saudi Arabia. To the best of our knowledge, no studies have been done, hitherto, in this region. An insight into the awareness among PHC level Physicians, of an important problem like MS, would be a guide to devise effective management strategies.

There is a significant deficiency of knowledge among PHC Physician in this part of Saudi Arabia, with slightly more than half (51.7%) having poor knowledge. Physicians working at PHC level are at the forefront of healthcare delivery system. The low knowledge score among a significant number of such healthcare workforce is a matter of grave concern. This is more critical in Saudi Arabia which has an estimated nearly 40% prevalence rate of MS (3, 20).

The criteria for diagnosis of MS was known by a majority of the respondents (94.1%) in our study. Alharbi YAM has reported a relatively lower awareness (74.5%) from Makkah (19). Interestingly though, only about more than a quarter (28%) were aware about the serum LDL cutoff value for diagnosis of MS. Reiner Z et al. has reported that 53.3% of PHC Physicians in Croatia knew about this parameter(16). The knowledge regarding primary aim of lipid lowering drugs, target of antihypertensive therapy among diabetics, and waist circumference values, ranged from about two thirds to three fourth of the subjects (78%, 66% and 69.5% respectively). The knowledge in these aspects in our study is better than that reported by Alharbi YAM from Makkah (19). In the study from Makkah, the authors noted correct answers for these questions as 72.6%, 68.9% and 42.5% respectively (19). Of particular interest in the diagnosis of MS is the waist circumference. This parameter is a central fulcrum of MS diagnosis according to IDF criteria (5). Slightly more than thirty percent of subjects in our study did not know that it is an essential criteria for diagnosis of MS. This highlights an important lacuna in the diagnostic criteria of MS.

Attitude towards MS among PHC Physicians is an important

Table 9
Relationship between demographic variables and practice.

Practice items	Gender		Nationality		Specialty	
	Chi-square	P-value	Chi-square	P-value	Chi-square	P-value
Once you diagnose patient with essential hypertension you will screen him/her for metabolic syndrome	2.97	.226	2.96	.227	7.07	.718
Did you manage patient with metabolic syndrome ?	0.02	.883	1.72	.189	11.96	.035
What types of management you did? (Education)	3.28	0.06	5.13	.030	47.85	.001
What types of management you did? (Diet advice)	6.39	0.001	7.67	.001	65.6	0.0001
What types of management you did? (Exercise advice)	5.55	0.01	6.78	.001	73.5	0.0001
What types of management you did? (Medication)	2.77	0.09	7.23	.001	66.6	0.0001
Did you attend any training about metabolic syndrome ?	0.21	.642	0.6	.438	6.58	.254

indicator of overall approach in the management of MS. The significance of regular monitoring of diabetes, hypertension and dyslipidemia was understood by a majority of the participants (48.3% agreed, and 35.6% strongly agreed). This is similar to the finding among PHC Physicians at Makkah, where 93.4% agreed on this point (19). A majority of subjects in our study agreed that the management of MS is generally effective (overall 85.6%). This is in concurrence with the study done at Makkah (19). A fairly large number were also confident of managing MS. There is a keenness among the medical practitioners to learn more about MS, as evident from their feeling that they should attend further trainings. Muhammed et al. have demonstrated, how training impacts physicians knowledge regarding MS. They showed that all physicians that attended continued medical education programs are more knowledgeable. This was in contrast to those that did not attend any such programs, in whom only 20.7% knew well about this syndrome (17). 59.3% of the participant in our study mentioned that they would always screen a patient diagnosed with hypertension, for MS. However, a significant proportion said they would do so only occasionally. It would be clinically prudent to screen all recently diagnosed cases of hypertension, for the presence of other parameters of MS. MS is a shown to increase the risk of CVD (2, 5, and 12). An early detection and an effective management in terms of lifestyle modifications and pharmacologic treatment if required, would significantly reduce the risk of CVD (10). In our study, almost two thirds mentioned that they have been managing patients with MS. Of these, over fifty percent did so through education, diet advice, exercise advice and medications. Alharbi YAM has noted a similar proportion of medical practitioner doing so in Makkah (19).

MS has been recognized as an important clinical syndrome that could have serious health repercussions (4, 12). The key in preventing such adverse outcomes is early detection of the syndromes and an effective management (5). Primary care physicians work at grassroots and are extremely crucial in detecting such cases at the earlies. With Saudi Arabia having one of the highest prevalence rates of MS, a proactive approach is required to combat this scourge.

7. Conclusion

Our study highlights some extremely interesting facts. Though, significant number of PHC Physicians are aware about MS, there are misgivings regarding some aspects of MS. LDL cholesterol cutoff levels are not known correctly by a majority. About a third of the respondents were screening for MS in newly diagnosed hypertensive patients occasionally. Only about two thirds are managing MS cases. A majority desired more training programs and mentioned that they haven't attended any training programs for MS. There is a need to increase the awareness of MS among the PHC Physicians. More training programs need to be planned. A better awareness among primary care physician is warranted for an early diagnosis and effective management of MS in Saudi Arabia.

Conflicts of interest

Authors declare that there is no any conflict of interest.

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Abbreviations

MS: metabolic syndrome
CVD: cardiovascular diseases
NCEP ATPIII: Third Adult Treatment Panel
WHO: World Health Organization
IDF: International Diabetes Foundation
AHA: American Heart Association
NHLBI: National Heart, Lung, and Blood Institute
HDL: high-density lipoprotein
FPG: Fasting plasma glucose
OGTT: oral glucose tolerance test
USA: United States of America
MBBS: Bachelor of Medicine, Bachelor of Surgery
MRCPGP: Membership of the Royal College of General Practitioners
KSA: Kingdom of Saudi Arabia
PHCC: primary health care center
PHC: primary health care
SPSS: Statistical Package for the Social Sciences
CI: Confidence interval