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Review

Prevalence of metabolic syndrome in Iran: A meta-analysis of 69 studies

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ABSTRACT

Aims: Metabolic syndrome increases the risk of chronic diseases including cardiovascular diseases and diabetes. The present study investigated the prevalence of metabolic syndrome in Iran.
Materials and methods: Published articles in English and Persian during 2000–2016 identified using keywords of prevalence, metabolic syndrome, and Iran in the following databases: Web of Science, PubMed, Scopus, Google scholar, SID and Magiran. Random effect model used to calculate the pooled estimates. Heterogeneity of studies assessed using Q statistic, and geographical distribution of metabolic syndrome demonstrated via GIS map. Data were analyzed by STATA-11.
Results: The overall prevalence of metabolic syndrome was 30.4% (95%CI: 28.3–32.6) with no significant heterogeneity by diagnostic criteria. The lowest frequency was reported in Sistan and Baluchestan Province [18.3% (95% CI: 12.9–25.8)] compared to the highest in Bushehr [57.8% (95% CI: 41.8–80.0)]. It was significantly more prevalent in women [(34.8% (95%CI: 31.2–38.8)] compared to men [25.7% (95%CI: 23.4–28.3)] ($P = 0.001$)]. A significant increasing trend ($P = 0.001$) was observed in different age groups, as metabolic syndrome increased from 12.1% (95% CI: 9.37–15.6) in 20–29 years-old age group to 51.7% (95%CI: 47.4–56.4) in the over 60 years-old age group.
Conclusions: Approximately one-third of Iranian adults have metabolic syndrome which varied by regions, age and gender. Then, appropriate intervention based on behavioral patterns of inhabitants and local conditions may help to reduce the burden of disease.

1. Introduction

Metabolic syndrome is a set of metabolic disorders including central obesity, insulin resistance or impaired glucose absorption and metabolism, lipid disorders, and high blood pressure [1]. Because of the increasing prevalence and poor prognosis, metabolic syndrome is one of the main public health problems of the current century, with an increasing trend in developed and developing countries [2]. The global prevalence of this disorder is reported between 14% and 32%, which increases with aging in both sexes [3]. For example, at least a quarter of the USA population suffers from this syndrome [4]. The prevalence of metabolic syndrome in other parts of the world has been reported as 25.9% in Denmark [5], and 28.8% in Turkey [6]. Based on the available data, almost one-third of the adult population in Iran (33.7%) have metabolic syndrome, with significantly greater prevalence in women compared to men, like in other parts of the world (42% V 24%) [7].

According to epidemiological studies, a series of genetic, metabolic, and environmental factors including diet have a major role in the progress of metabolic syndrome [8]. Thus, in recent years, metabolic syndrome has been regarded as a health-threatening problem due to lifestyle changes, and subsequent changes in food and behavioral patterns, increasing technological development and

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sedentary lifestyle in developed and developing countries such as Iran [9].

Iran has a population of more than 70 million people, with different ethnicities, lifestyles; cultures, socioeconomic status and environmental conditions, and each of these can have a significant role in the frequency distribution of this disease [10]. Thus, it is necessary for health sector to recognize the pattern of this disease in terms of location, time, and age and gender groups.

Some systematic studies have investigated the prevalence of metabolic syndrome in Iran so far, but none has used the Geographical Information System (GIS) to find its geographical distribution. Moreover, none of these studies has investigated its frequency for different age groups and genders.

Therefore, the present study aimed to find out the frequency of metabolic syndrome according to four criteria of ATPIII, IDF, NCEP-ATPIII, and AHA/NHLBI, and for different age and gender groups and time series. In addition, the geographical distribution of this disease is shown on the map of Iran using GIS.

2. Methods

Search Strategy and Data Sources: The present study systematically reviewed the prevalence of metabolic syndrome in Iran using published articles in English and Persian amongst healthy population of the country during 2000–2016. Relevant studies were identified through Web of Science, PubMed, Scopus, Google scholar, Magiran and SID using MESH heading search terms such as prevalence, metabolic syndrome, Iran, and their combinations. Additionally, references from identified studies also scanned for any other relevant articles.

Study Selection: Studies were included if they had conducted on the age group ≥20 years and if they had used the following four criteria (ATPIII, AHA/NHLBI, NCEP-ATPIII, and IDF) for the calculation of the prevalence of metabolic syndrome. Irrelevant studies and those without the required information by which to calculate SEs were excluded. Researchers contacted corresponding authors of studies lacking sufficient information on the phone or via email to increase the study quality if it was possible. Furthermore, from duplicated articles, those with a larger sample size or recently published ones were included in the present study. Finally, 69 articles were included in this meta-analysis.

Data Extraction: The abstract and full text of the articles were independently reviewed by two researchers (K.K.F. and A.A.M) and data were extracted and recorded in Excel software in a researcher-made checklist containing author's name, publication year, study setting, age and gender of participants, sample size, metabolic syndrome assessment criteria, overall prevalence of metabolic syndrome, and its confidence interval.

2.1. Data synthesis and statistical analysis

The pooled estimates of the prevalence and confidence interval of metabolic syndrome were obtained by means of a random effect approach. Studies were weighted based on the inverse of the variance of log prevalence. For homogeneity of included studies, their confidence interval was calculated in STATA by Exact method. Heterogeneity of studies was determined using the Q statistic, and the source of heterogeneity was identified by subgroup and meta-regression analysis. Forest Plots were used to present the results and confidence interval of 95% by standard assessment criteria, gender, age groups and time series. GIS map was used to show the prevalence of metabolic syndrome by different provinces. Data were analyzed in STATA-11.

3. Results

Studies were included if they were conducted during 2000–2016 and met the inclusioncriteria. Of the 729 paperswere potentially relevant; 41 were unrelated titles, 578 were irrelevant, 30 were duplicates, and 11 were not eligible, which were excluded. A total of 69 articles with a total of 146644 individuals were eligible for inclusion in these analyses (Fig. 1). The summary characteristics of included studies (i.e. first author, publication year, province, place of residence, sample size, gender, age, inclusion criteria, and prevalence and confidence interval) are presented in Table 1.

The overall pooled estimate of the metabolic syndrome was 30.4% (95%CI: 28.3–32.6). GIS was used to show geographical distribution of metabolic syndrome for different provinces where data

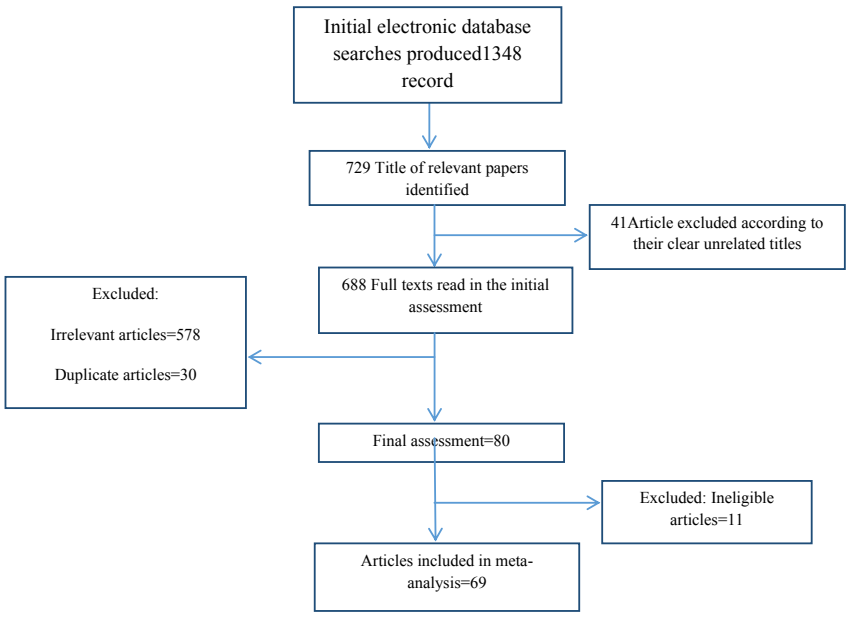

Fig. 1. Flowchart of the literature search.

Table 1
Studies reporting prevalence of metabolic syndrome in Iran.

First Author/Year (Reference Number)	Setting			Sample		Metabolic syndrome	
	Province	District	Residential areaR,U	No. (Sex)	Age(years)	Diagnostic criteria	Prevalence (95% CI)
Mohebbi(2012) [11]	West Azerbaijan	–	#NA	12138(M)	20–69	¶IDF	**32.4 (31.6–33.2)**
Azak(2015) [12]	West Azerbaijan	–	NA	10000(M)	20–76	IDF	**33.7 (32.8–34.6)**
Alizadeh(2013) [13]	East Azerbaijan	Basmang	U	132(MF‡)	18–40	§ATPIII	**11.5 (6.5–18.0)**
Frootan(2011) [14]	East Azerbaijan	Tabriz	U	350(MF)	65–90	ATPIII	**55.4 (50.1–60.7)**
Esmailnasab(2012) [15]	Kurdistan	–	*R,U	1194(MF)	25–64	ATPIII	**29.1 (26.5–31.7)**
Esmailzadehha (2013) [16]	Qazvin	mindoodar	U	1107(MF)	20–7	ATPIII	**26.2 (23.6–28.9)**
						‖NCEP-ATPIII	**30.6 (27.9–33.4)**
						IDF	**34.2 (31.4–37.1)**
						**AHA/NHLBI	**33.0 (30.2–35.8)**
Javadi(2014) [17]	Qazvin	mindoodar	U	996(MF)	≥24	NCEP-ATPIII	**33.0 (30.1–36.1)**
Yazdi(2012) [18]	Qazvin	oeinzahr	NA	192(M)	39.4 ± 1.3	ATPIII	**23.0 (17.2–29.5)**
Soltani(2015) [19]	Zanjan	Zanjan	U	18(MF)	24–67	NCEP-ATPIII	**21. 2 (4.0–30.2)**
Ghodrati(2014) [20]	Zanjan	Zanjan	NA	76(MF)	40–84	NCEP-ATPIII	**26.3 (16.9–37.7)**
Sharifi(2015) [21]	Zanjan	Znjan	R,U*	120(M)	46.5 ± 9	NCEP-ATPIII	**18.3 (11.9–26. 4)**
Sharifi(2009) [22]	Zanjan	Zanjan	U	2941(MF)	≥20	NCEP-ATPIII	**23.7 (22.2–25.3)**
KARIMI(2011) [23]	Zanjan	Zanjan	NA	96(F)	>18	ATPIII	**35.4 (25.9–45.8)**
MoravejAleali(2016) [24]	Khuzestan	Ahvaz	U	913(MF)	≥20	NCEP-ATPIII	**22.8 (20.1–25.6)**
						IDF	**28.4 (25.5–31.4)**
Rasoulinejad(2015) [25]	Khuzestan	Ahvaz	NA	100(MF	59.51 ± 9.13	ATPIII	**38.0 (28.5–48.)**
Ziaei(2011) [26]	Khuzestan	Ahvaz	NA	140(F)	45–75	ATPIII	**42.9 (34.5–51.5)**
Azizi(2003) [27]	Tehran	Tehran	U	9846(MF)	≥20	ATPIII	**33.7 (32.8–34.6)**
Esteghamati(2008) [28]	Tehran	Tehran	U	2752(MF)	≥18	IDF	**27.0 (25.3–28.7)**
Fakhrzadeh(2009) [29]	Tehran	Tehran	R,U	122(MF)	≥60	ATPIII	**33.3 (25.3–42.7)**
Jouyandeh(2013) [30]	Tehran	Tehran	NA	118(F)	52.67 ± 5	ATPIII	**30.1 (22.4–39.7)**
Esmaillzade(2011) [31]	Tehran	Tehran	U	486( )	40–60	ATPIII	**30.0 (26.0–34.3)**
NamaziShabestari (2016) [32]	Tehran	Tehran	NA	264(F)	>40	NCEP-ATPIII	**41.(35.3 - 47.5)**
Esteghamati(2011) [33]	Tehran, Ilam	Tehran, Ilam	R,U	1245(M)	25–64	NCEP-ATPIII	**29.9 (27.3–32.5)**
				1415(F)			**45.3 (42.7–47.9)**
Eshtiaghi(2010) [34]	Tehran	Tehran	NA	940(F)	20–76	NCEP-ATPIII	**26.4 (23.6–29.3)**
Ebrahimpour(2010) [35]	Tehran	Tehran	U	607(M)	25–64	ATPIII	**19.0 (15.9–22.3)**
				681			**35.0 (31.4–38.7)**
				F(Premenopausal)			**60.0 (54.1–65.7)**
				285F (Postmenopausal)			
Nakhjavani(2011) [36]	Tehran	Tehran	NA	71(MF)	49.7 ± 1.5	ATPIII	**22.5 (13.5–34.0)**
Marjani(2012) [37]	Golestan	Gorgan	U	160 (F)	20–40	ATPIII	**23.8 (17.4–31.1)**
Marjani(2012) [38]	Golestan	Gorgan	U	160 (F)	20–40	ATPIII	**20.6 (14.6–27.7)**
shahini(2013) [39]	Golestan	Gorgan	U	160(F)	32.33 ± 137.08	ATPIII	**35.0 (27.6 - 42. 9)**
					32.33 ± 7.08		
Marjani(2012) [40]	Golestan	Gorgan	U	100(F)	54.12 ± 5.28	ATPIII	**31.0 (22.1–41.0)**
Kabir(2013) [41]	Golestan	Kalaleh	NA	1309	≥50 (MF)	IDF	**29.9 (27.4–32.4)**
Veghari(2015) [42]	Golestan	Kordkoy and Kalaleh	U	248(MF)	25–70	ATPIII	**37.9 (31.8–44.3)**
Delavar(2009) [43]	Mazandaran	Babol	U	944(F)	30–50	ATPIII	**31.0 (28. 1 - 34.1)**
Mahjoub(2012) [44]	Mazandaran	Babol	U	933(MF)	≥20	NCEP-ATPIII	**23.7 (21.0–26.5)**
Hajian-Tilaki(2014) [45]	Mazandaran	Babol	U	1000(MF)	20–70	ATPIII	**42.3 (39.2–45.4)**
Ostovaneh (2014) [46]	Mazandaran	Amol	U	5826(MF)2243(MF)	>16	NCEP-ATPIII	**27. 8 (26.6 - 28.9)**
	Sistan&Baluchestan	Zahedan					**12.1 (10.7–13.5)**
AMIRKALALI(2014) [47]	Mazandaran	Amol	R,U	5023(MF)	18–90	NCEP-ATPIII	**29.6 (28.3–30.9)**
Bayani(2016) [48]	Mazandaran	Amirkola	U	1562(MF)	≥60	ATPIII	**66.7 (64.3–69.0)**
						NCEP-ATPIII	**71.9 (69.6–74.1)**
						IDF	**68.8 (66.5–71.1)**
Saberi(2011) [49]	Isfahan	Kashan	U	429(M)	21–73	ATPIII	**35.9 (31.4–40.6)**
Barahimi(2009) [50]	Isfahan	shahreza	R,U	1501(F)	15–49	IDF	**17.3 (15.4–19.3)**
						NCEP-ATPIII	**9.7 (8.3–11.3)**
Salmasi(2014) [51]	Isfahan	Isfahan	U	200(MF)	34.2 ± 8.01	NCEP-ATPIII	**15.0 (10.4–20.7)**
Sarrafzadegan(2008) [52]	Isfahan,-Markazi	Isfahan,Arak, Nagafabad	R,U	12514(MF)	≥19	ATPIII	**23.3 (22.6–24.1)**
Alavi(2015) [53]	Qom	Qom	U	1488(MF)	36.0 ± 7.7	NCEP-ATPIII	**35.9 (33.4–38.4)**
Akbarzadeh(2013) [54]	Fars	Shiraz	U	34(M)	≥30	ATPIII	**35.3 (19.7–53.5)**
Karimi(2015) [55]	Fars	Kavar	R	13304(MF)	≥20	ATPIII)2001)	**25.1 (24.4–25.8)**
						IIDF	**28.3 (27.5–29.1)**
						NCEP-ATPIII	**27.7 (26.9–28.5)**
Rahmanian(2011) [56]	Fars	Jahrom	U	892(MF)	≥30	modified NCEPIII	**28.8 (25.9–31.9)**
Akbarzadeh(2011) [57]	Fars	Shiraz	U	34F (control)	>30	ATPIII	**10.2 (1.9–23.7)**
				34F(case)			**17.9 (6.8–34.5)**
Maharlouei(2013) [58]	Fars	Shiraz	R,U	490	≥40	NCEP-ATPIII	**30.0 (26.0–34.3)**
				(F(premenopausal)		IDF	**32.2 (28.1–36.6)**
				434		NCEP-ATPIII	**51.2 (46.3–55.9)**
				(F Postmenopausal)		IDF	**53.2 (48.4–58.0)**

Table 1 (*continued*)

First Author/Year (Reference Number)	Setting			Sample		Metabolic syndrome	
	Province	District	Residential areaR,U	No. (Sex)	Age(years)	Diagnostic criteria	Prevalence (95% CI)
Tabatabaie(2015) [59]	Fars	Shiraz	R,U	377(MF)	≥20	NCEP-ATPIII	**26.8 (22.4–31.6)**
Babai(2016) [60]	Fars	Shiraz	NA	12283(MF)	20–65	NCEP-ATPIII	**38.9 (38.0–39.8)**
BagheriLankarani(2013) [61]	Fars	Shiraz	U	290(MF)	≥20	ATPIII	**13.4 (9.7–17.9)**
Kaykhaei(2012) [62]	Sistan&Baluchestan	zahedan	U	1802(MF)	≥19	IDF	**24.8 (22.8–26.9)**
						NCEP-ATPIII	**21.0 (19.1–22.9)**
GhiyasTabari(2015)) [63]	Sistan&Baluchestan	Chabahar	U	120(F)	15–45	ATPIII	**17.5 (11.2–25.5)**
Yousefzadeh (2015) [64]	Kerman	Kerman	U	2271(M)	15–75	NCEP-ATPIII	**31.0 (29.1–32.9)**
				2959(F)		IDF	**38.0 (36.2–39.8)**
							25.2 (23.4–27.0)
							42.5 (40.7–44.3)
Gozashti(2014) [65]	Kerman	Kerman	NA	300(MF)	≥20	NCEP-ATPIII	**36.7 (31.2–42.4)**
Sanjari(2011) [66]	Kerman	Kerman	U	946(F)	25–53	IDF	**36.7 (33.6–39.8)**
Sadrbafoghi(2007) [67]	Yazd	Yazd	U	1110(MF)	20–74	ATPIII	**32.1 (29.3–34.9)**
Shahvazi(2016) [68]	Yazd	Yazd	U	450(F)	20–60	NCEP-ATPIII	**39.1 (34.6–43.8)**
						IDF	**40. 9 (36.3 - 45.6)**
Ebrahimi (2009) [69]	Khorasanrazavi	Mashhad	NA	1276(MF)	33–80	IDF	**51.8 (49.0–54.6)**
						ATPIII	**50.6 (47.8–53.4)**
Azimi- Nezhad(2009) [70]	Khorasan	–	R,U	4928(MF)	15–65	ATPIII	**39.9 (38.5–41.3)**
Kazemi(2013) [71]	Khorasan	Birjand	NA	94(MF)	≤50	NCEP-ATPIII	**16.3 (9.2–25.0)**
Khayyatzadeh(2016) [72]	Khorasan	Mashhad	U	2899(M)	35–65	IDF	**13.0 (11.8–14.3)**
				2865(F)			**18.0 (16.6–19.5)**
Razavi(2013) [73]	Khorasan	Sarakhs	U	758(M)	20–69	AHA/NHLBI	**30.1 (26.8–33.5)**
Rahebghorbani(2012) [74]	Semnan	Semnan، DamghanShahroud، Garmsar	R,U	3799(MF)	30–70	NCEP-ATPIII	**28.5 (27.1–30.0)**
						IDF	**35.8 (34.3–37.3)**
Ebrahimi(2016) [75]	Semnan	Shahroud	NA	991(M)	20–60+	ATPIII	**26.1 (23.4–29.0)**
						IDF	**35.2 (32.2–38.3)**
						AHA/NHLBI	**31.6 (28.7–34.6)**
Maddah(2015) [76]	Semnan	Semnan	NA	500(F)	>18	NCEP-ATPIII	**11.6 (8.9–14.7)**
				125(M)			**22.5 (15.4–30.7)**
Falahi(2013) [77]	Koramabad	Lorestan	U	973(MF)	>18	AHA/NHLBI	**29.0 (26.1–31.9)**
Nabipour(2007) [78]	(Bushehr -Hormozghan Provinces)	Boshehr,Genaveh, Deilam	U	3723(MF)	≥25	ATPIII	**49.1 (47.5–50.7)**
Movahed(2012) [79]	Bushehr	Bushehr	U	382(F)	50–83	ATPIII	**68.3 (63.4–73.0)**

were available. Geographical distribution of the syndrome was varied in different regions such that the lowest prevalence was found in Sistan and Baluchestan Province with 18.3% (95%CI: 12.9–25.8) and the highest was seen in Bushehr Province with 57.8% (95%CI: 41.8–80) (Fig. 2).

Fig. 3 showed the frequency of the metabolic syndrome by different diagnostic criteria, gender, age groups, and publication year. Frequency of metabolic syndrome was somewhat different

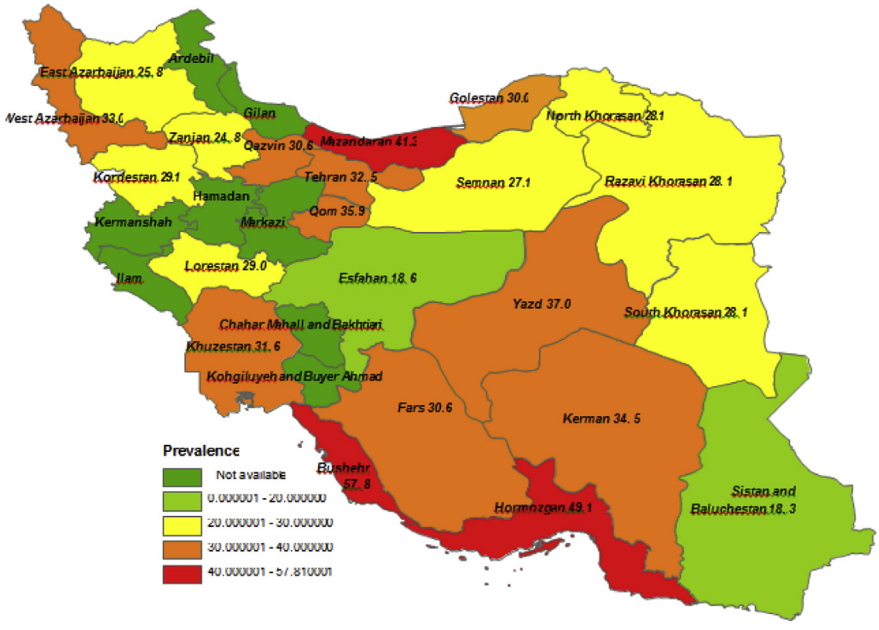

Fig. 2. Prevalence of metabolic syndrome in different regions of Iran.

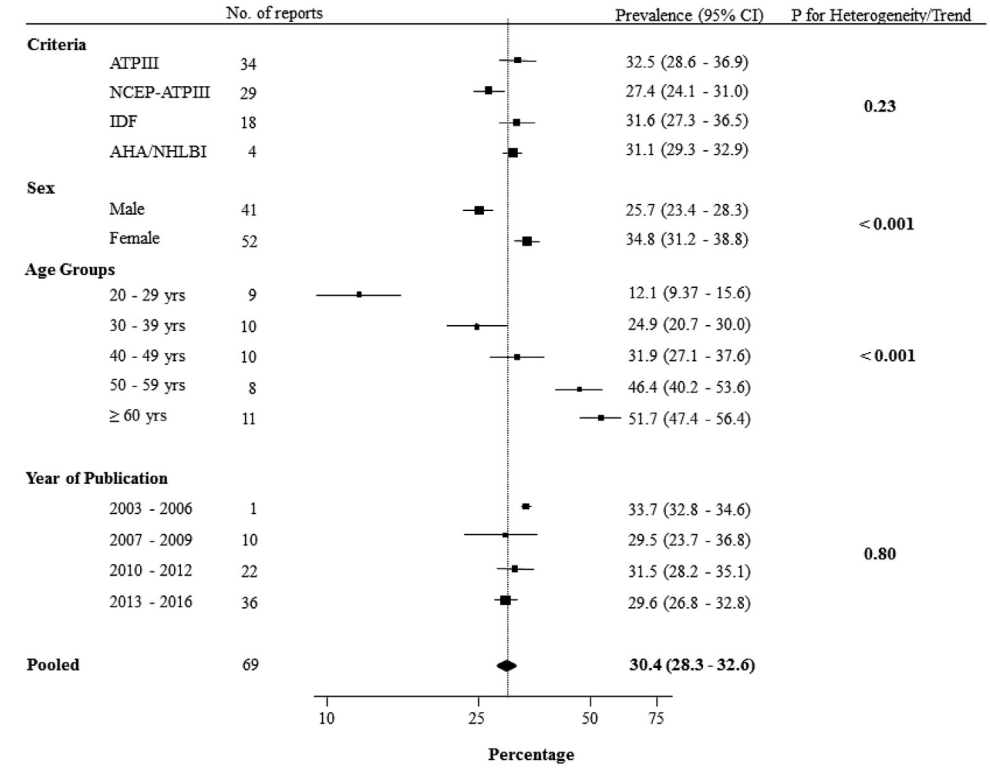

Fig. 3. Sensitivity analysis of the Prevalence of Metabolic Syndrome in Iran.

based on diagnostic criteria, with 27.4% (95% CI: 24.1–31.0) for NCEP-ATPIII, 31.1 (95% CI: 29.3–32.9) for AHA/NHLBI, 31.6 (95%CI: 27.3–36.5) for IDF, and 32.5% (95%CI: 28.6–36.9) for ATPIII, it was not statistically significant (P = 0.230). The prevalence was significantly higher in women [34.8% (95%CI: 31.2–38.8)] compared to men (25.7% (95% CI: 23.4–28.3 (P = 0.001).

The frequency of metabolic syndrome steadily and significantly increased with aging, such that it increased from 12.1% (95%CI: 9.37–15.6) in 20–29 year-old age group to 51.7% (95%CI: 47.4–56.4) among those over 60-years-old age (P for trend = 0.001). However, the prevalence based on article publication year did not show a significant trend (Fig. 3) (P = 0.80). Analysis of the results by gender in different age groups showed a higher prevalence in men compared to women in age groups younger than 30–39 years, but this considerably increased in women compared to men after the ages of 40–49 years (Fig. 4).

ATPIII§ = Adult Treatment Panel III; NCEP-ATPIII‖ = National Cholesterol Education Program—Third Adult Treatment Panel; IDF¶ = International Diabetes Federation; AHA/NHLBI** = American Heart Association and the National Heart Lung and Blood Institute N# = Not Available; R,U* R = Rural, Urban; MF‡ = Male and Female.

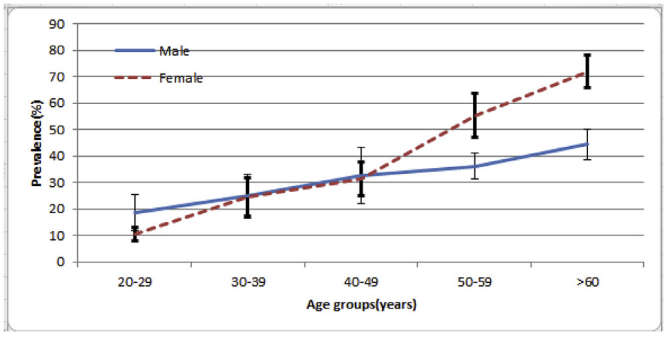

Fig. 4. Prevalence of metabolic syndrome by age and sex.

4. Discussion

The findings of the study showed that approximately one-third of the Iranian population over 20 years of age have metabolic syndrome, and this frequency has been reported differently in various parts of the country. The frequency of metabolic syndrome in the study population steadily increased with aging; such that in the age group of over 50-year-old, roughly half of the population suffered from metabolic syndrome (about four times that in the 20-29 year-old population). The prevalence of this syndrome in women was also reported 10% higher than that inmen. Two sexes were compared in different age groups, and the frequency of the syndrome was higher in men compared to women in those younger than 30 years, while it was significantly higher in women compared to men in the age group of older than 40 years.

The overall prevalence of the syndrome was found 30.4%, which is much higher than the prevalence in countries such as Japan (5.3%) [80], and America (22.9%) [81], but similar to Lebanon (31.2%) [7].Perhaps, aging of the Iranian population could explain the increase in the prevalence of metabolic syndrome [10].

Geographical distribution of metabolic syndrome was found to be different in different provinces, with the lowest prevalence in Sistan and Baluchestan Province (18.3%) and the highest in Bushehr Province (57.8%). Genetic factors and different lifestyles could be the main reasons for the difference among provinces [82], such that people in West of Iran consume more vegetables and have a healthier diet, while high-fat and high-calorie foods make up the main part of people's diet in central Iran [75]. For example, Yazd

Province has the highest per capita consumption of sugar [83], while in Sistan and Baluchestan Province, bread and cereals claim the most shares of costs due to larger household size, and low income and purchasing power [84].

The results show an increasing prevalence of metabolic syndrome in men compared to women in the younger than 30-year-old age group, but a sharper increase in the prevalence within women compared to men in the older than 40-year-old age group. In agreement with the present study, the prevalence of metabolic syndrome in 24–39 year-old Finnish men was higher than that in women because risk accumulation is more likely in young men than that in women [85]. The increase in the prevalence of metabolic syndrome, especially in women can be due to the transition from youth to postmenopause stage, which usually appears with reduced estrogen level [35]. In addition, there is a significant relationship between increased triglyceride and abdominal obesity in postmenopausal women [86].

The ascending trend of prevalence with aging is also found in other studies [87], such that 45% of 19–39 year-old people have high blood pressure, 25% large waist circumference, and triglyceride, and 20% suffer from reduced HDL level. The prevalence of high blood pressure and waist circumference in men increases with aging. The highest prevalence of triglyceride and reduced HDL is found in the 40-49 year-old age group, and this prevalence reduces in the 50 to 78 year-old age group. A similar pattern is also observed in women, except that triglyceride increases and HDL decreases in women with aging [88]. Generally, it can be said that a collection of unhealthy behaviors such as reduced physical activity, unhealthy diet, obesity, untreated dyslipidemia and blood pressure, changes in serum insulin, and other physiological and environmental factors are responsible for increased prevalence of metabolic syndrome in older ages [89].

The prevalence was 34.8% in women against 25.7% in men, with emphasis on the fact that a higher prevalence was found in women compared to men in all four criteria. Many studies conducted on different populations indicate a higher prevalence of metabolic syndrome in women compared to men [90]. Reduced physical activity [91] and increased subcutaneous fat in women of all ages due to anatomic reasons may explain the higher prevalence of obesity and subsequent metabolic syndrome in Iranian women compared to men [92].

In the present study, the trend of prevalence was not constant during the study years. During 2013-16, the prevalence of metabolic syndrome was 29.6%. The slight increase in 2010-12 to 31.4% made no tangible difference from 2007 to 2009 (29.5%). However, the results of a longitudinal study conducted in Iran over 12 years showed a 6.9% increase in the prevalence of metabolic syndrome [89].

5. Conclusion

Although the prevalence of metabolic syndrome varies in different parts of the country, one-third of people over 20 years of age suffer from this syndrome. The prevalence is higher in some regions and increases with aging. Thus, it is necessary to plan according to conditions of different regions for solving this health problem.

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