



Journal Homepage: -[www.journalijar.com](http://www.journalijar.com)

## INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/13708

DOI URL: <http://dx.doi.org/10.21474/IJAR01/13708>



### RESEARCH ARTICLE

#### DIETARY PRACTICES OF DIABETES MELLITUS PATIENTS TYPE 2 IN RELATION WITH DEMOGRAPHIC VARIABLES AT PRIVATE AND GOVERNMENT HOSPITALS IN SANA'A CITY, YEMEN, 2018

**Dr. Mansour M.A. Ghaleb**

Faculty of Medicine and Health Sciences-Department of Clinical Nutrition and Dietetics, University of Science and Technology, The 60th Road, Sana'a, Yemen.

#### Manuscript Info

##### Manuscript History

Received: 05 September 2021

Final Accepted: 10 October 2021

Published: November 2021

##### Key words:-

Dietary Practices, Adults Diabetes Patients In Sana'a

#### Abstract

**Background:** Diabetes mellitus is one of the most common chronic diseases in nearly all countries. The most common type is type 2 diabetes. Dietary practices of diabetes mellitus patients type 2 in relation with demographic variables at private and government hospitals in Sana'a city, Yemen the objective of present study. A hospital-based cross – sectional descriptive study conducted from October 2018 to May 2019, among adults from both gender attended to the selected hospital in Sana'a to receive health service. A prepared questionnaire was used for data collection. Data analyzed by using SPSS software version 20 was used. Descriptive statistics were performed to describe the socio-demographic and dietary practices variables. Data described by frequencies and percentages and presented in tables. Chi square test was used to test differences in dietary practices in relation with demographic variables. Test considered to be significant p value < 0.05. The sample was formed of 200 adult diabetic patients, more than half (53.5%) were females. Ages of participant ranged between 25 years and 80 years, with a mean of  $52 \pm 11$  years. Illiterate women represented 62% of total women, while illiterate men represented 13% of total men. Nearly half of participants had poor dietary practices (45.5%) towards diabetes. There was a better score of good & acceptable dietary practices tend to be more in private hospitals. There is a need to strengthen good dietary practices through health education.

Copy Right, IJAR, 2021.. All rights reserved.

#### Introduction:-

Diabetes is a chronic, metabolic disease characterized by elevated level of blood sugar, which leads over time to serious damage to the heart, blood vessels, eyes, kidneys, and nerves<sup>[1]</sup>. Diabetes mellitus is one of the most common chronic diseases in nearly all countries, and continues to increase in numbers and significance, as economic development and urbanization lead to changing lifestyles characterized by reduced physical activity, and increased obesity<sup>[4]</sup>. It is rapidly gaining a potential epidemic state all over the world<sup>[5]</sup>. The number of people with diabetes has risen from 108 million in 1980 to 422 million in 2014<sup>[6]</sup>. This figure is projected to be 592 million by 2035<sup>[7]</sup>. The global prevalence among adults over 18 years of age has risen from 4.7% in 1980 to 8.5% in 2014<sup>[6]</sup>.

**Corresponding Author:- Dr. Mansour M.A. Ghaleb**

Address:- Faculty of Medicine and Health Sciences-Department of Clinical Nutrition and Dietetics, University of Science and Technology, The 60th Road, Sana'a, Yemen.

Almost half of all deaths attributable to high blood glucose occur before the age of 70 years. WHO estimates that diabetes was the seventh leading cause of death in where it was the direct cause of 2.2 million deaths in 2012<sup>[1]</sup> and 4.9 million deaths in 2014<sup>[7]</sup>.

In Yemen, WHO estimated that 327,000 were suffering from DM in the year 2000, and it is projected to 1,286,000 by the year 2030<sup>[11]</sup>. Vision on current health situation in Yemen is obscure and knowledge about epidemiology of DM is still poor. Available sources give different or conflicting results, and there is little data in the literature available on this issue. Gunaid A. and Assabri A. reported that overall crude prevalence of diabetes was 10.4% and the age-standardized rate was 6.3% among people in a semi-rural area<sup>[21]</sup>. According to WHO (2016), prevalence of diabetes in Yemen was 7.7%<sup>[22]</sup>. So, it is worthy to conduct different studies on many aspects of DM. It is an autoimmune disease characterized by pancreatic  $\beta$  cell destruction and an absolute deficiency of insulin<sup>[2]</sup>. Glucose intolerance may develop during pregnancy<sup>[3]</sup>.

Obesity, especially visceral adiposity, and physical inactivity are major risk factors for diabetes<sup>[8]</sup>.

There is increased risk of DM if person have a parent, brother, or sister with DM<sup>[9]</sup>. Foods rich in high glycemic load and high glycemic index, particularly white bread and polished rice<sup>[10]</sup>. Reduced exposure to sunlight with traditional clothing among women may be one contributor to vitamin D deficiency, which has been linked to increased rates of obesity and T2DM among women<sup>[11]</sup>.

Health illiteracy is common in Mediterranean region, and Yemen is not an exception. People often consider obesity as a cosmetic problem and rarely view it as a disease. Patients with diabetes are rarely scheduled for routine eye or foot examinations. There is no routine annual checkup or screening DM. Patients with diabetes rarely change their eating or exercise habits after a diabetes diagnosis. They are not stick to routine daily glucose monitoring. There is no routine follow-up or HbA1C testing for patients with diabetes. Patients with diabetes visit governmental or non-governmental health care centers to get their medications for free or for a small fee, but not for regular evaluation. Most patients with T2DM think that diabetes should only be treated by oral medications, and they often resist insulin injections when indicated. These factors result in poor glycemic control, late diagnosis, and increased prevalence of diabetes complications. Unfortunately, most patients consider their disease and its complications as an inevitable fate and believe that they don't have any role or power in altering or preventing it<sup>[10]</sup>.

Age 45 or older, high blood pressure, low level of HDL, or a high level of triglycerides, history of gestational diabetes or gave birth to a baby weighing 9 pounds or more, history of heart disease or stroke, depression, polycystic ovary syndrome, acanthosis nigricans—dark, thick, and velvety skin around neck or armpits as the other factors contributing to diabetes<sup>[13]</sup>. The increased prevalence of T2DM can be attributed to unhealthy attitudes and practices related to T2DM. The most obvious assumption is that poor attitudes and practices stem from poor knowledge about DM and how to prevent and manage it<sup>[14]</sup>.

Knowledge directly influences the attitude and practices of patients with T2DM and is vital to decrease not just the incidence, but also the morbidity and mortality<sup>[15]</sup>. It has an influence on the likelihood of making lifestyle changes, which in turn can predict the behavior practices and outcomes of patients DM<sup>[16]</sup>. The assumption is made that patients who are knowledgeable about DM are more likely to take ownership of their condition and become involved in their treatment<sup>[17]</sup>. Surveys from developing countries revealed unsatisfactory knowledge, awareness, and practices of the diabetic patients<sup>[19, 20]</sup>.

## Material And Methods:-

The study conducted in Sana'a city where there are public and private hospital that gave health care to adult patient with type 2 diabetes, the hospitals included are: Public hospitals: Al-Thawrah General Hospital (TGH), and Al-Gomhouri General Hospital (GGH). Private hospitals: University of Science and Technology Hospital (USTH), and Saudi-German Hospital (SGH). In addition, the study conducted from October 2018 to May 2019. All adult patients with type 2 diabetes from both gender attended to the selected hospital in Sana'a to receive health service. Cross-sectional study performed using a convenience sampling technique of all adult patients with type 2 diabetes whose came to outpatient department in selected hospitals. Data collected by face-to-face interviews using pre-designed, semi-structured questionnaires to assess dietary practices of adult patients with type 2 diabetes in relation with demographic variables, all the questionnaire was developed in 2 parts. The first part included socio-demographic variables as type of hospital, gender, age, level of education, residency place, marital status, number of family

members, and occupation. Part 2 included questions regarding practice. The sample was 200 adult patients with type 2 diabetes enrolled in the study based on a convenient sample; all patients available during data collection were invited to be involved in the study. Dependent variables: dietary practice. Independent variables: type of hospital – gender – age - level of education - residency place - marital status - number of family members – occupation. The questionnaires were tested prior to the study among 5-10% of the total estimated sample size to assess, consistency, length, competency, clarity and the time required to carry out face to face interview smoothly. Statistical Package for the Social Sciences (SPSS) software, version 20 was used. Raw data were entered then further processing was performed which practice scored into “good & acceptable” and “poor”. Suitable tests were chosen according to the aim and types of variables. Descriptive statistics were performed to describe the demographic and dietary practices variables. Data described by frequencies, percentages. Chi square test was used to test differences in demographic variables and dietary practices of patient type 2 diabetes at private and government hospitals in Sana'a city. Test considered to be significant if (p value) < 0.05. The research protocol approval and ethical clearance was obtained from UST Faculty Medicine and Health Sciences and Clinical Nutrition Department; also, permission was obtained from the directors of the two public and two private hospitals. The data collectors were informed the patients that their participation in the study will be voluntary and they have full right to accept or refuse to participate in the study after details explanation of the purposes of the study. The responses of the patients were unnamed to keep the confidentiality. The results of the study were useful to assess the dietary practices of patients towards T2D in relation to demographic variables in Sana'a city. Inclusion criteria, any patient who presented to study places during period of data collection, and diagnosed as diabetic and agreed to participate in the study. Exclusion criteria Patients under 18 years and patients of non-Yemeni origin, or who refused to participate in the study were excluded from the study.

## Results:-

**Table 1:-** Summary of demographic characteristics of the sample.

Feature	Category	Count	Percent
Gender	Males	93	46.5%
	Females	107	53.5%
Age	25 – 40 years	34	17%
	41 – 55 years	100	50%
	> 55 years	66	33%
Education	Illiterate	78	39.0%
	Read & write	34	17.0%
	Elementary school	36	18.0%
	Secondary school	27	13.5%
	University	25	12.5%
Occupation	Professionals	18	9.0%
	Free business	30	15.0%
	Employees	36	18.0%
	Laborers	10	5.0%
	Housewives	91	45.5%
	Others	15	7.5%
Marital status	Married	190	95.0%
	Single	3	1.5%
	Divorced	7	3.5%
Residency	Rural	47	23.5%
	Urban	153	76.5%
Family members	1 - 7 persons	146	73.0%
	8 - 13 persons	36	18.0%
	> 13 persons	18	9.0%
Type of hospital	Public	100	50%
	Private	100	50%

### Distribution of patients according to demographic characteristics

Two hundred patients were enrolled in this study. Males represented 93 (46.5%) and females represented 107 (53.5%). Their ages ranged between 25 years and 80 years, with a mean of  $52 \pm 11$  years. The most frequent age group (50%) was located between 41 - 55 years, followed by > 55 years group (33%), followed by 25 – 40 years group (17%). Most of study participants (95%) were married. Only (1.5%) were unmarried, and (3.5%) were divorced. Minority of participants (23.5%) lived in rural areas, and majority of them (76.5%) lived out of urban areas. 39% of patients were illiterate, 17% read & write, 18% had primary education, 13.5% had secondary education, and 12.5% had university education. Illiterate females in this study represented 62% of total females, while illiterate males represented 13% of total males. The difference was significant ( $p$  value < 0.05). The most frequent occupation for males were employees (36.6%) and free business (30%), while the majority (85%) of females were housewives. Other occupations were less frequent. Family members ranged from 1 to 30, with a mean of  $8 \pm 4$  members. About three fourths (73%) of patients lived with a family of 1 to 7 individuals, about one fifth (18%) of patients lived with a family of 8 to 13 individuals, and about tenth (9%) of patients lived with a family of 14 to 30 individuals. Half of the sample was taken from public hospitals, and half of it taken from private hospitals.

**Table 2:-** Dietary practices of diabetes patients type 2.

Feature	Category	Count	Percent
Many people tend to forget taking medication. How often have you forgotten to take your diabetic medication in the last week?	Good & acceptable	111	55.5%
	Poor	89	44.5%
How often have you done physical work or exercise in the last week?	Good & acceptable	188	94.0%
	Poor	12	6.0%
On the days when you do physical work or exercise: how long did it last on an average day?	Good & acceptable	67	33.5%
	Poor	133	66.5%
How often do you eat refined starch, such as white bread or cake?	Good & acceptable	73	36.5%
	Poor	127	63.5%
How often do you eat fatty food, like chips?	Good & acceptable	143	71.5%
	Poor	57	28.5%
How often do you eat food with lots of salt in food preparation?	Good & acceptable	113	56.5%
	Poor	87	43.5%
How often do you eat vegetables?	Good & acceptable	144	72.0%
	Poor	56	28.0%
How often do you eat fruit?	Good & acceptable	106	53.0%
	Poor	94	47.0%
What type of cold drink do you mostly drink?	Good & acceptable	99	49.5%
	Poor	101	50.5%
How often do you drink these cold drinks?	Good & acceptable	122	61.0%
	Poor	78	39.0%
<b>Total practice</b>	<b>Good &amp; acceptable</b>	<b>109</b>	<b>54.5%</b>
	<b>Poor</b>	<b>91</b>	<b>45.5%</b>

Regarding patients' dietary practices, 54.5% of patients considered to had "good & acceptable" dietary practices. The remaining portion considered to had "poor" dietary practices as shown in table above. "Good & acceptable" dietary practices tend to be more in private hospitals and the difference was significant ( $p$  value < 0.05).

**Table 3:-** Correlation between dietary practices in relation with demographic variables diabetes patients type 2.

Correlation		Dietary Practice
Type of hospital (public, private)	Pearson Correlation	.191**
	P value	.007
	N	200
Gender (males, females)	Pearson Correlation	.175*
	P value	.013

	N	200
Education	Pearson Correlation	-.108-
	P value	.127
	N	200

\*.Correlation is significant at the 0.05 level (2-tailed).

\*\* .Correlation is significant at the 0.01 level (2-tailed).

**Correlation between dietary practices and demographic variables of diabetes patients type 2.** Type of hospital (public or private) had a significant positive correlation with dietary practice. That means good dietary practices tend to be more in private hospitals (p values < 0.05). Gender correlates positively with dietary practices. That means dietary practices tend to be better in females. However, the only significant correlation was found between gender and practices (p value < 0.05).

### Discussion:-

This hospital-based survey was conducted on patients of DM. Two hundred patients were enrolled in this study. Half of them were taken from public hospitals (TGH, GGH) and other half from private hospitals (USTH, SGH). Females represented 107 (53.5%). Ages of participant ranged between 25 years and 80 years, with a mean of  $52 \pm 11$  years. The most frequent age group (50%) was located between 41 - 55 years. Similar results were found in a study done in Mukalla by Khamis Y et al., who reported that the mean age of diabetic patients was  $53.2 \pm 8.3$  years, 50% of diabetics belonged to age group of 40 to 60 years, and females represented 55%<sup>[23]</sup>. Gunaid A. and Assabri A. conducted a study in simirural area in Sana'a and reported similar results<sup>[21]</sup>.

In present study, majority of sample (95%) were married. Almost the same rate (95.4%) reported by Khamis Y. et al<sup>[23]</sup>. This high percentage of marriage could be explained by the prevalence of DM being more in adults and elderly. Some other studies reported that marital status reached 89.4%<sup>[5]</sup>.

Literate people in present study accounted for 61%, while illiterate accounted for 39%. This result is supporting what was reported by UNESCO in which adult literacy rate reported to be 64% and illiteracy rate 36%<sup>[31]</sup>. These rates were higher than that reported in a study conducted in Mukalla in which illiterate adults represented 82.6%<sup>[23]</sup>.

Illiterate women in this study represented 62% of total women, while illiterate men represented 13% of total men and the difference was significant (p value < 0.05). Some studies reported higher rates of illiteracy in which 89% of women and 50% of men were illiterate<sup>[21]</sup>.

In present study revealed that the most frequent occupation for males were employees (36.6%) and free business (30%), while the majority (85%) of females were housewives. Other occupations were less frequent.

Family members ranged from 1 to 30, with a mean of  $8 \pm 4$  members. About three fourths (73%) of patients lived with a family of 1 to 7 individuals. These data are similar to previous demographic statistical reports on Yemen<sup>[32]</sup>. About tenth (9%) of study sample lives with big families that consists of more than 14 members, and might involve 30 members. The high number of family members is attributed to presence of compound families in which grandfather, sons, and grandsons live together in the same house.

Regarding practices, 54.5% of diabetic patients In present study had good dietary practices towards DM. In present study goes in concordance with a previous study done in Ethiopia (56.6%)<sup>[33]</sup> but higher than finding in a study done in Mukalla city (12.9%)<sup>[23]</sup> and in Kenya (41%)<sup>[19]</sup>.

Most of patients (55%) In present study stated that they never forget to take their medications, 94% do exercise but 33.5% do exercise regularly, about 72% avoid to eat fatty food, 56% avoid to eat salty food, 72% used to eat vegetables, and 53% used to eat fruit. These results are comparable to results in a previous study<sup>[24]</sup>.

In present study revealed that females had better score in dietary practices. In a similar study in Bangladesh, males scored better in dietary practice<sup>[26]</sup>. In present study revealed that there was no significant difference regarding dietary practice. In a similar study in Bangladesh<sup>[26]</sup> and another in India<sup>[39]</sup> there was better scoring for KAP in higher levels of education and the correlation was significant. In present study results revealed that "Good

&acceptable” dietary practices tend to be more in private hospitals and the difference is significant (p value <0.05). In present study, females have more and significant level of dietary practices (p value < 0.05). In a study done in Nigeria it was also reported that females had better score in practice<sup>[33]</sup> and higher awareness<sup>[40]</sup>.

### Conclusion:-

Two hundred diabetic patients were enrolled in this hospital-based survey. Half of them were taken from public hospitals (TGH, GGH) and other half from private hospitals (USTH, SGH). More than half (53.5%) were females. Ages of participant ranged between 25 years and 80 years, with a mean of  $52 \pm 11$  years. The most frequent age group (50%) was located between 41 - 55 years.

Majority of participant (95%) were married. Illiterate women represented 62% of total women, while illiterate men represented 13% of total men. The most frequent occupation for males were employees (36.6%) and free business (30%), while the majority (85%) of females were housewives. Family members ranged from 1 to 30, with a mean of  $8 \pm 4$  members. Most of participants (73%) lived with families consisted of 1 to 7 individuals.

Nearly half (45.5%) of them had poor dietary practices towards DM. Majority of participants (72%) avoid eating fatty food, and more than half (56%) avoid eating salty food. Majority (72%) of patients used to eat vegetables regularly, and nearly half (53%) used to eat fruits regularly. Also, nearly half of patients (55%) had good dietary practices regarding adherence to their medications.

Regarding relation between gender and practices, there was a better score in females practices.

As for education level and dietary practices, there was no significant difference regarding dietary practice. In present study revealed that there was no significant difference between public and private hospitals. Good & acceptable dietary practices tend to be more in private hospitals.

So, modification of patient's behavior and dietary practices are essential to address the related healthy eating habits, physical exercise, regular blood glucose monitoring, and medication adherence as the most important aspect to influence patient's attitude and practices positively and It has been proven that increasing knowledge regarding diabetes and its complications has significant benefits in management and treatment<sup>[27-30]</sup>.

### References:-

1. WHO. Diabetes 2018 [cited 2019]. Available from: <https://www.who.int/en/news-room/fact-sheets/detail/diabetes>.
2. Vinay Kumar AKA, Jon C. Aster. The Endocrine System. In: Maitra A, editor. Robbins and Cotran Pathologic Basis of Disease: Elsevier Inc.; 2015. p. 1107.
3. Dennis L. Kasper ASF, Dan L. Longo, Eugene Braunwald, Stephen L. Hauser, J. Larry Jameson,. Diabetes Mellitus. In: Powers AC, editor. Harrison's Principles of Internal Medicine. USA: McGraw-Hill; 2005. p. 2153.
4. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes research and clinical practice. 2011;94(3):311-21.
5. Koley M, Saha S, Arya JS, Choubey G, Ghosh S, Chattopadhyay R, et al. Knowledge, Attitude, and Practice Related to Diabetes Mellitus Among Diabetics and Nondiabetics Visiting Homeopathic Hospitals in West Bengal, India. Journal of evidence-based complementary & alternative medicine. 2016;21(1):39-47.
6. Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Angelantonio D, et al. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Emerging Risk Factors Collaboration. Lancet. 2010;26(375):2215-22.
7. Ogurtsova K, da Rocha Fernandes J, Huang Y, Linnenkamp U, Guariguata L, Cho N, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. Diabetes research and clinical practice. 2017;128:40-50.
8. Karimkhani C, Dellavalle RP, Coffeng LE, Flohr C, Hay RJ, Langan SM, et al. Global skin disease morbidity and mortality: an update from the global burden of disease study 2013. JAMA dermatology. 2017;153(5):406-12.
9. CDC. Diabetes Home-Who's at Risk? 2019 [cited 2019]. Available from: <https://www.cdc.gov/diabetes/basics/risk-factors.html>.

10. Hegazi R, El-Gamal M, Abdel-Hady N, Hamdy O. Epidemiology of and risk factors for type 2 diabetes in Egypt. *Annals of global health*. 2015;81(6):814-20.
11. Fields J, Trivedi NJ, Horton E, Mechanick JI. Vitamin D in the Persian Gulf: integrative physiology and socioeconomic factors. *Current osteoporosis reports*. 2011;9(4):243.
12. Chehadeh W, Abdella N, Ben-Nakhi A, Al-Arouj M, Al-Nakib W. Risk factors for the development of diabetes mellitus in chronic hepatitis C virus genotype 4 infection. *Journal of gastroenterology and hepatology*. 2009;24(1):42-8.
13. The National Institute of Diabetes and Digestive and Kidney Diseases. Risk Factors for Type 2 Diabetes 2019 [cited 2019 6-4-2019]. Available from: <https://www.niddk.nih.gov/health-information/diabetes/overview/risk-factors-type-2-diabetes>.
14. Ng SH, Chan KH, Lian ZY, Chuah YH, Waseem AN, Kadirvelu A. Reality vs illusion: knowledge, attitude and practice among diabetic patients. *Int J Collab Res Internal Med*. 2012;4(5):723.
15. Faber M, Kruger HS. Dietary intake, perceptions regarding body weight, and attitudes toward weight control of normal weight, overweight, and obese black females in a rural village in South Africa. *Ethn Dis*. 2005;15(2):238-45.
16. Delamater AM. Improving patient adherence. *Clinical diabetes*. 2006;24(2):71-7.
17. Abdo NM, Mohamed ME. Effectiveness of health education program for type 2 diabetes mellitus patients attending Zagazig University Diabetes Clinic, Egypt. *J Egypt Public Health Assoc*. 2010;85(3-4):113-30.
18. Ayele K, Tesfa B, Abebe L, Tilahun T, Girma E. Self care behavior among patients with diabetes in Harari, Eastern Ethiopia: the health belief model perspective. *PloS one*. 2012;7(4):e35515.
19. Maina WK, Ndegwa ZM, Njenga EW, Muchemi EW. Knowledge, attitude and practices related to diabetes among community members in four provinces in Kenya: a cross-sectional study. *Pan African Medical Journal*. 2010;7(1).
20. Nisar N, Khan IA, Qadri MH, Sher SA. Knowledge and risk assessment of diabetes mellitus at primary care level: a preventive approach required combating the disease in a developing country. *Pak J Med Sci*. 2008;24(5):667-72.
21. Gunaid A, Assabri A. Prevalence of type 2 diabetes and other cardiovascular risk factors in a semirural area in Yemen. 2008.
22. WHO. Diabetes country profiles 2016 2016 [cited 2019]. Available from: [https://www.who.int/diabetes/country-profiles/yem\\_en.pdf?ua=1](https://www.who.int/diabetes/country-profiles/yem_en.pdf?ua=1).
23. Khamis Y, Allah MAA, Sayed S, Mohamed N, Al-Hadad AM. Knowledge, Attitudes and Practices of patient with Diabetes Mellitus in Mukalla City-Yemen 2015. Available from: <https://www.researchgate.net/publication/281749546>.
24. Roux MI. Diabetes-related knowledge, attitude and practices (kap) of adult patients with type 2 diabetes in the free state, south africa: University of the Free State 2016.
25. Balla SA, Ahmed HA, Awadelkareem MA. Prevalence of diabetes, knowledge, and attitude of rural, population towards diabetes and hypoglycaemic event, Sudan 2013. *Am J Health Res*. 2014;2(6):356-60.
26. Kaniz F, Sharmin H, Khurshid N, Hasina A, Chowdhury, Jesmin A, Tahmina K, et al. Knowledge attitude and practice regarding diabetes mellitus among Nondiabetic and diabetic study participants in Bangladesh. *BMC Public Health*. 2017;17:364.
27. Smalls BL, Walker RJ, Hernandez-Tejada MA, Campbell JA, Davis KS, Egede LE. Associations between coping, diabetes knowledge, medication adherence and self-care behaviors in adults with type 2 diabetes. *General hospital psychiatry*. 2012;34(4):385-9.
28. Kheir N, Greer W, Yousif A, Al Geed H, Al Okkah R. Knowledge, attitude and practices of Qatari patients with type 2 diabetes mellitus. *International journal of pharmacy practice*. 2011;19(3):185-91.
29. Rani P, Raman R, Subramani S, Perumal G, Kumaramanickavel G, Sharma T. Knowledge of diabetes and diabetic retinopathy among rural populations in India, and the influence of knowledge of diabetic retinopathy on attitude and practice. *Rural & Remote Health*. 2008;8(3).
30. Visser A, Snoek F. Perspectives on education and counseling for diabetes patients. Elsevier; 2004.
31. Wikipedia.org. Yemen Population 2019 [cited 2019 5-4-2019]. Available from: [https://ar.wikipedia.org/wiki/%D8%B3%D9%83%D8%A7%D9%86\\_%D8%A7%D9%84%D9%8A%D9%85%D9%86](https://ar.wikipedia.org/wiki/%D8%B3%D9%83%D8%A7%D9%86_%D8%A7%D9%84%D9%8A%D9%85%D9%86).
32. Library of Congress - Federal Research Division. Yemen 2012.
33. Kassahun CW, Mekonen AG. Knowledge, attitude, practices and their associated factors towards diabetes mellitus among non diabetes community members of Bale Zone administrative towns, South East Ethiopia. A cross-sectional study. *PloS one*. 2017;12(2):e0170040.

34. Al Shafae MA, Al-Shukaili S, Rizvi SGA, Al Farsi Y, Khan MA, Ganguly SS, et al. Knowledge and perceptions of diabetes in a semi-urban Omani population. *BMC Public Health*. 2008;8(1):249.
35. Singh R, Khobragade M, Kumar A. A cross-sectional study on knowledge, attitude and practices among diabetic patients about diabetes and its complications in Central Delhi. *MRIMS J Health Sci*. 2013;1:44-7.
36. Zuhaid M, Zahir KK, Diju IU. Knowledge and perceptions of diabetes in urban and semi urban population of Peshawar, Pakistan. *Journal of Ayub Medical College Abbottabad*. 2012;24(1):105-8.
37. Asmamaw A, Asres G, Negese D, Fekadu A, Assefa G. Knowledge and attitude about diabetes mellitus and its associated factors among people in Debre Tabor town, Northwest Ethiopia: cross sectional study. *Science*. 2015;3(2):199-209.
38. Gillani A, Amirul Islam F, Hayat K, Atif N, Yang C, Chang J, et al. Knowledge, Attitudes and Practices Regarding Diabetes in the General Population: A Cross-Sectional Study from Pakistan. *International journal of environmental research and public health*. 2018;15(9):1906.
39. Solanki JD, Sheth NS, Shah CJ, HB M. Knowledge, attitude, and practice of urban Gujarati type 2 diabetics: Prevalence and impact on disease control. *Journal of Education and Health Promotion*. 2017;6(35):1-7.
40. Masood I, Saleem A, Hassan A, Zia A, Khan AT. Evaluation of diabetes awareness among general population of Bahawalpur, Pakistan. *Primary care diabetes*. 2016;10(1):3-9.
41. Mufunda E, Wikby K, Björn A, Hjelm K. Level and determinants of diabetes knowledge in patients with diabetes in Zimbabwe: a cross-sectional study. *The Pan African Medical Journal*. 2012;13.