ORIGINAL ARTICLE

Hypertension and Type 2 Diabetes: Prevalence and Risk Factors among Adults, Suggested Nursing Protocol

NAGWA MOHAMED[1], AHMED MOHAMED[2]
[1]Nursing Department University of tabuk, /, Saudi Arabia
[2]Faculty of nursing- Assiut university Egypt
Correspondence to: Nagwa Mohamed, Email: n-mohamed@ut.edu.sa

ABSTRACT

In addition to clinical problems in both economically developed nations as well as emerging countries, hypertension and type 2 diabetes pose challenges to human safety in general. The spread of factors leading to hypertension and type 2 diabetes among Saudi citizens has caused epidemic proportions due to the richness of the quality of life. The research aims to Assessing the level of hypertension and type 2 diabetes in Saudi adults and to establish a suggested nursing procedure for the early diagnosis of hypertension and type 2 diabetes. Descriptive and association analysis methodology has been used. Where 120 adults engaged in the research at Tabuk University in Saudi Arabia from September 2018 to March 2019. 10% of participants were hyperglycemic and more than 10% were hypertensive, and the major risk factors were sedentary behaviors for more than 3 hours a day and carbonated drinks/fruit juice. This research indicates that type 2 diabetes and hypertension will impact people with significant health problems in the future. The main effort to encourage healthier nutrition, active living, regular fitness and a healthy lifestyle is also a health issue.

Keywords: Prevalence, Risk Factors; Hypertension; Type 2 diabetes; Suggested Nursing Protocol.

INTRODUCTION

Non-communicable illnesses have been the world's leading causes of death and illness burden. The risk of death due to complications of type 2 diabetes is known to be relatively high due to a relatively limited early diagnosis. Low blood sugar kills the muscles and tissues of the body. The greater the amount of blood sugar and the more you treat it, the higher the risk of coronary artery disease signs, heart failure and stroke, neuropathy, nephropathy, and certain complications such as tumors and sores that do not cure skin diseases such as bacterial and fungal infections 1.

Many developed countries are experiencing a significant shift in dietary practices with respect to eating habits, evidence suggested a link between the intake of soft drinks with obesity and type 2 diabetes, resulting from large amounts of high fructose corn syrup used in the manufacturing of soft drinks, which raises blood glucose levels and BMI to the dangerous levels, diet, soft drinks contain glycated chemicals that markedly augment insulin resistance2. Food intake has been strongly linked with obesity, not only related to the volume of food but also in terms of the composition and quality of diet.40 High intake of red meat, sweets and fried foods, contribute to the increased the risk of insulin resistance and T2DM. Physical movement, physical activity enormously improved abnormal glucose tolerance when caused by insulin resistance primarily than when it was caused by deficient amounts of circulating insulin. 3 personal activities such as smoking. In Saudi society, with increased reliance on technology and electronic media, the use of means of transport, and rapid urbanization growth, idle activity is becoming increasingly widespread both globally and locally. Long-term sitting is associated with the prevalence of obesity and a consequence of chronic diseases such as diabetes and cardiovascular disease, even though the amount of physical activity is controlled during leisure time. 5 There is also little evidence from Saudi Arabia on the influence of changes in our lives, such as physical exercise and eating patterns, on the prevalence of hypertension, hypercholesterolemia, and diabetes mellitus. As a result, rapid shifts have arisen in Saudi Arabia 6.

The prevalence of hypertension in the people of Saudi Arabia is observed to be high; on the other hand, there are limited awareness-raising and prevention steps that involve the development of a qualified awareness programmer to monitor prevalence in the Saudi Arab population 7.

Preventing non-communicable conditions such as type 2 diabetes and hypertension can be accomplished by the procurement of adequate knowledge, training on risk factors and connectivity. Any of the dangers associated with diet and behavioral habits may be modified 8.

As regards the correlation between hypertension and type 2 diabetes the category most at risk for having hypertension is people with type 2 diabetes. Hypertension and type 2 diabetes are associated with each other in the way that their fundamental cause is primarily obesity. In addition, a link between hypertension and type 2 diabetes obesity has been investigated 9.

The combination of type 2 diabetes and hypertension is particularly lethal according to the ADA, and can significantly increase the risk of heart failure or stroke. type 2 diabetes and hypertension also improve the risk of other disorders associated with type 2 diabetes, such as kidney failure and retinopathy, which can contribute to the development of blindness by 9.

The relevance of this research is due to the importance of hypertension and type 2 diabetes as a major cause of common serious diseases in most Eastern countries. Health education and training on the prevalence of certain risk factors and their implications for most people's activities, diets and social addictions in terms of technology and entertainment are required.

It was also thought that there was a need to enhance the coverage of high-risk communities who are at the crossroads of growth and to which any positive primary prevention will be the most significant, provided that they are the antecedents of our vision of a stable future. This research will promote more exploratory studies on lowering risk factors among young people in a high-risk country such as Saudi Arabia 10

The aim of this study was to estimate the prevalence and classify risk factors for hypertension and type 2 diabetes (some are modifiable –such as inactivity, diet, smoking, obesity) (some are non-modifiable such as family history, gender, age) among adults at Tabuk University in Saudi Arabia and to establish a suggested nursing procedure for the prevention and early detection of hypnosis.

METHODS

A descriptive correlative research design was utilized in this study. The research was performed at Tabuk University on 120 adult respondents (employees and students) in various locations such as university colleges. The samples were convenience from male and female persons working at the same place we get information by questionnaire and examining. We divided them into four groups the largest was by gender the males and females are not the same numbers as shown in schematic (1). Figure 1 shows the schematic diagram of the methodology steps in the current study. Three approaches have been used in this analysis:
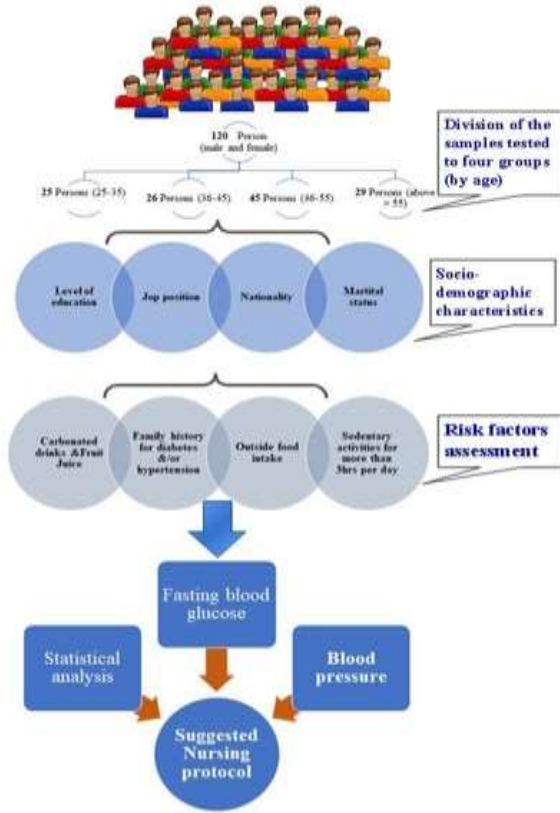
Figure 1: Schematic diagram of the methodology steps.

Tool (I): Standardized self-governing questionnaire: This study was based on a review of previous national and international literature. It's made up of two parts:

Part (1): Socio-demographic characteristics and medical data of the sample population, including gender, residency, age, marital status, etc.

Part (2): Health appraisal sheet of patients, which contains the following:

It consisted of 25 questions and used the Likert 4-point scale to test participants in terms of age, gender, educational background, socio-economic status, laboratory inquiry, blood glucose sample and blood pressure control.

Data Collection Instrument and Procedure

Body weight (kg) and height (cm) were measured to the nearest 0.1 unit in barefoot subjects with light clothing. Body mass index (BMI) was calculated as weight divided by height squared (kg/m2). BMI was classified into two categories (< 25 and ≥25) according to their risk of hypertension.34 Blood pressure (BP) was recorded using a mercury sphygmomanometer BP cuff with the appropriate size that covers two-thirds of the arm with the subject in the sitting position. The arm which was used for BP measurement was supported on a flat table. Participants were asked to rest for at least 5 minutes and if they were taking any caffeinated beverages they were rested for 30 minutes before measurement. Two consecutive measurements were taken 5 minutes apart, and the mean value was taken. All participants were advised to fast on the morning of their clinic appointment to allow for the measurement of their FBG using a glucometer. Participants underwent venous sampling for FBG and HbA1c, and the blood sent to the laboratory. Glycated hemoglobin was measured using a 902 Automatic Analyzer with Roche/Hitachi kit.

Resource (II): Sheet of evaluation of risk factors.

The goal was to determine the prevalence of cardiovascular risk factors diseases (family history and pre-existing medical problems such as asthma, type 2 diabetes and hyperlipidemia). In addition to the following:

• Size waist -to-height ratio (WHR > 0.5).
• A family with a diagnosis of diabetes or hypertension.
• Mostly get weight from the consumption of high calories.
• Sedentary activities for more than 3 hours a day.
• Carbonated beverages and fruit juice.

Tool (III): A suggested nursing protocol.

It was developed by researchers on the basis of a literature review. It seeks to enhance the awareness and practice of nurses for early diagnosis of both hypertension and type 2 diabetes; it consists of two parts:

Part one: understanding of hypertension includes explanation, signs and symptoms of the causes, diagnosis, risk factors, care, optimal blood pressure regulation (by exercise and diet, control and complications).

Part two: Information on type 2 diabetes including descriptions, signs and symptoms, diagnosis, risk factors, care, way of controlling the optimum level of type 2 diabetes (by exercise and diet, management and complications). The tools were tested for accuracy, validity, comprehensiveness, understanding, applicability and ease of use by 5 academic and nursing experts from the Faculty of Medicine and Nursing at Tabuk University in Saudi Arabia, requiring slight modifications.

The modifications were made accordingly, and the tools were then configured in their final configuration. The reliability of the material was calculated by the Alpha Cronbach test and the result was R=0.68.

Part three: implementation

At initial interview the researcher introduce herself to initiate line of communication, explain the nature & purpose of the designed nursing protocol to assess nurse's knowledge before application of designed nursing protocol. Also she scheduled with them the teaching sessions for both theory and practice and the nurses were divided into small groups, each group contains 5 nurses. The designed nursing protocol has been implemented for nurses in terms of sessions and teaching on the spot during their official working hours. There were a total of 10sessions. These sessions were repeated 10 times to each group. Number of nurses in each session 4-5 nurses. The duration of each session was half an hour, including 15 minutes for discussion and feedback. Each session usually started by a summary of what has been taught during the previous sessions and the objectives of the new topics. Feedback and reinforcement of designed nursing protocol was performed according to the nurses needs to ensure their understanding. Giving praise and/or recognition to the interested nurses were emphasized for motivation during the designed nursing protocol implementation.

Ethical Consent: The official letter of approval was obtained from the University of Tabuk (Tabuk Region, Saudi Arabia) prior to the start of the data collection; confirmation was issued for research purposes in order to gain permission and cooperation for data collection from the study participants. The thesis was approved by the Ethical Committee of the University of Tabuk on 20 September 2018, number: S-1439-0028. The details gathered by the participants must remain private and anonymity would be assured participants were informed of the voluntary nature of their involvement in the study and were given the freedom to refuse without punishment or lack of benefit. It was also mentioned that the findings of the study would be interpreted in a fashion that would make it impossible to identify the participants. A pilot analysis was performed on 12 volunteers. The goal of this analysis was to identify any specific issue in the statements with regard to the consistency, viability and applicability of the instrument. No changes have been made to the evaluation sheet. Data were then collected at the University of Tabuk during the period from September 2018 to March 2019.

Statistical Analysis: Statistical Package for Social Sciences (SPSS) version 20.0 was used for conducting statistical analysis of data (IBM SPSS statistics for Windows, version 20; IBM Corp,

Armonk, NY, USA). Chi-square test was applied to analyze the association of various parameters with HTN and DM among the geriatric population. Stepwise logistic regression analysis was applied to assess the independent contribution of different factors to the presence of HTN and DM.

RESULTS

120 participants, 60 (50%) were male, while 60 (50%) were female. The sample population age ranged from 20 to over 55 years of age. There were 21.7 % of participants aged 20 to 35 years, 21.7 per cent aged 36–45 years, 37.5 % aged 46–55 years and just 20 per cent aged over 55 years).

Table 1: Socio-demographic profiles and medical evidence of the participants analyzed (n=120)

Demographics	N. = 120	%
Gender		
Male	60	50%
Female	60	50%
Age		
(20-35)	25	20.8%
(36-45)	26	21.7%
(46-55)	45	37.5%
above 55	29	20%
Level of education		
School	24	20%
Diploma	22	18.3%
Undergraduate	62	51.6%
Graduate	12	10%
Job Position		
Employees	58	48.3%
Students	62	52.7%
Nationality		
Saudi	75	62.5%
Non Saudi	45	37.5%
Marital Status		
Single	80	66.7%
Married	28	23.3%
Divorced	7	5.8%%
Widowed	5	4.2%

Fig.2 indicates that the bulk of systolic and diastolic blood pressure in total was 79.20 percent below 140/90 mmHg. Fasting blood glucose tests found that 10% of the subjects were hyperglycemic and 10% were borderline.
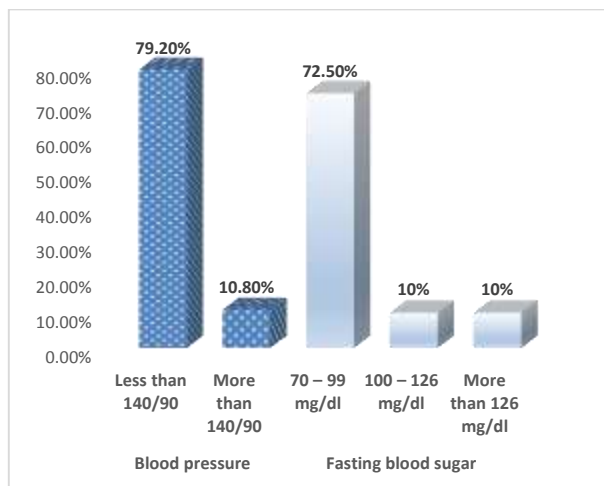

Figure 2: Participants' laboratory blood pressure and fasting blood glucose (No = 120).

Fig.3 indicates that triglycerides and total cholesterol levels were determined in both topics. The average percentage of unhealthy cholesterol was 17.5 % of participants and the

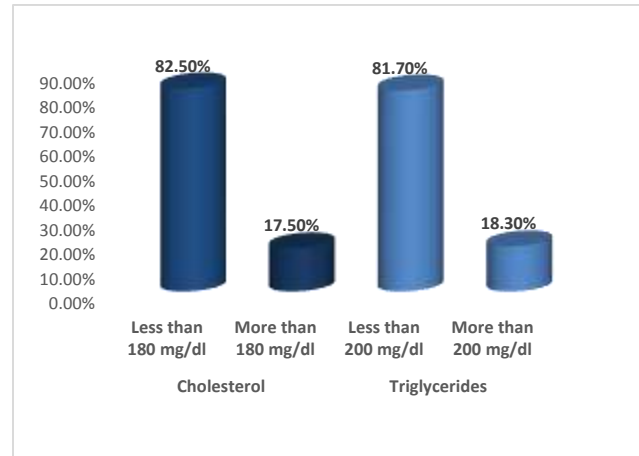percentage of abnormal triglycerides was 18.30%.

Figure 3: Frequency and Percentage of Laboratory blood tests (N. =120).

Part III: Risk factors: Table 2 indicates that the key risk factors associated with diabetes growth and hypertension among participants were sedentary practices for more than 3 hours a day and carbonated beverages/fruit juices for 31 % and 26% respectively.

Table 2: Distribution of the risk factors associated with development of diabetes and hypertension among participants (No=120).

Risk factor	Percentage
Carbonated drinks &Fruit Juice	26%
Family history for diabetes &/or hypertension	19%
Outside food intake	12%
Sedentary activities for more than 3hrs per day	31%
Consumption of fatty foods	80%
High-density lipoprotein (HDL)	50%
Tobacco smoking	70%
Body mass index	60%
Regular physical exercise	45%
Total cholesterol	35%

Part IV: Relationships: Normal blood pressure is an important issue and can affect a lot of health issues. Essential hypertension accounts for 95 % of cases of elevated blood pressure in adults. Secondary hypertension happens unexpectedly, and there are numerous disorders and medications that induce secondary hypertension, including renal issues, thyroid problems, alcoholism, and other drugs such as contraception drugs. What raises the risk of elevated blood pressure is smoking, breastfeeding, and the involvement of someone in the family who suffers from this condition (inheritance) in addition to obesity, lack of movement and salty foods. Blood pressure ratios varies by age, between 18 and 19 years of age, normal range is 117/77, between 20 and 24 years of age, normal range for blood pressure at this age is 120/79, between 25 and 29 years of age, normal range of blood pressure at that age 121/80, between 30 and 34 years of age, normal range for blood pressure assessment is 122/81, between 35 and 39 years of age, normal range.

Age between 45 and 49 years, the standard range of blood pressure measurements is 127/84. Age between 55 and 59 years, natural level of blood pressure 131/86. Consult the doctor whether your blood pressure rises or drops from the normal range based on your age. On the other hand, according to the American Diabetes Association, the target range of blood sugar levels should be between 5.0 and 7.2 mmol / L (90-130 mg / dL) before meals and less than 10 mmol / L (180 mg / dL) after meals. The average level of sugar is related to the age of the person and thus the normal rate of sugar for people under the age of 50 is less than 140 degrees and the normal percentage for those between the

ages of 50 and 60 is less than 150 degrees. Less than 160 degrees, above or below that, include control of blood glucose levels, in coordination with a physician, to assess the necessary dose for the patient.

Above or below that, include control of blood glucose levels, in coordination with a physician, to assess the necessary dose for the patient. WHO (September 2019) [12]

Table 3 is a mathematical study of ANOVA values for the findings demonstrating that age has an effect on blood pressure. From the values that have been given to F and P, the values are 3.62 and 0.015. This table also shows the study of ANOVA within various age groups with fasting blood glucose. F and P-values were 2.30 and 0.081 respectively, which relates to the non-significant association between age and fasting blood glucose.

Table 3: Relationship between blood pressure and blood glucose with age groups (No=120)

Factors	F	P- value
Blood pressure	3.62	0.015*
Fasting blood glucose	2.30	0.081^{ns}

DISCUSSION

The prevalence of hypertension and risk factors for type 2 diabetes is assessed by this study. It was the first research in the sense of a national party. The incidence of hyperlipidemia is growing and is the primary the cause of multiple diseases and risk factors such as type 2 diabetes and hypertension Thelin, A. (2014). [11] It is projected that there will be a rise of twenty-five percentage points in the developed countries and eighty percentage points in the developing countries in 2025. Expectations to rise are increasing than those WHO (2019). [12]

With respect to the incidence of hypertension, the predominant proportion of hypertension (10.8%) was equivalent to **Alqurashi,** et al. (2011) [13].in comparison to the meta-analysis (25 studies) of 10 sub-Saharan African countries. **James,** et al. (2014) [14]. This finding is not the same as that of Sack et al. (2017). Who observed a high proportion of the research population suffering from hypertension. This is possible due to the differentiation and heterogeneity of the sample subjects, the socio-demographic and economic characteristics and the cross-border distinction between nations.

Existing study has found that less than a fifth of the participants that have completed an earlier national review have hypertension consequences **American Diabetes Association** (2014) [15]. This indicates that the international hypertension affliction is prevalent and implies a growing urgency for a vital intervention. This research demonstrated a strong association between hypertension and age in both gender and national and global studies in many populations with diverse geographic, social and financial characteristics that are consistent with Azimi et al. (2008) [16]. Which suggested that the increase in risk factors for chronic non-communicable diseases (hypertension) is substantially high in the study population. Effective prevention steps should be prepared to prevent and monitor these risk factors.

With regard to the prevalence of type 2 diabetes, this analysis showed that the prevalence of type 2 diabetes was 10%. and borderline diabetes 10% was not comparable to the findings of Ansari. (2009) [17] which found that more than 20 % of their prevalence was people with diabetes and pre-people with diabetes.

In addition, Lee et al. (2011) [18] Notes in their report that the incidence of age-standardized diabetes in adults has risen, or at best remained constant, in all countries. There is a rise in the number of people who have diabetes relative to their age. It has also risen in developing countries than in rich countries. Sedentary practices for more than 3 hours a day and carbonated drinks/fruit juice were the key risk factors associated with the development of hypertension and diabetes among participants. It's consistent with A.A etal (2011) [19].

The results of this study show an association between DMT2

and hypertension and performing regular physical activities the physical activities were shown in other studies to play a role in the development of diabetes [C. etal 2003,] [20] Respondents who consumed fatty foods on a daily basis had a higher prevalence of DMT2 compared with those who did not [**National Health and Nutrition Examination Survey** 2009]. [21] Still, the relationship between DMT2 and consuming fatty foods on a daily basis is not significant. Our study shows that tobacco smokers had DMT2 more than nonsmokers [Causland. etal 2014] [22], but the relationship is not significant. This finding is inconsistent with that of Lipowiz et al2005]. [23] High levels of triglycerides, total cholesterol, and HDL showed significant associations with DMT2, in agreement with previous studies [Alwan etal 2014[24]. The relationships of these factors with DMT2 are consistent allover lipid profile studies. The variability of lipid panel components is noticed in this study as in the study of Causland. etal 2014] [22], where the percentages of total cholesterol were almost the same. The significance of total cholesterol as a risk factor is, however, different in this study **Ministry of Health, Kingdom of Saudi Arabia Projected Population, 2013**] [25], which shares the same results as an Iranian study [**Institute for Health Metrics and Evaluation**]2013]. [26],

A large number of cross-sectional as well as prospective and retrospective studies have found significant association between physical inactivity and T2DM.Weintein et al 2001. A prospective study was carried out among more than thousand nondiabetic individuals from the high-risk population of Pima Indians. During an average follow-up period of 6-year, it was found that the diabetes incidence rate remained higher in less active men and women from all BMI Assy et al 2008. [27], The existing evidence suggests a number of possible biological pathways for the protective effect of physical activity on the development of T2DM. First, it has been suggested that physical activity increases sensitivity to insulin. In a comprehensive report published by Health and Human Services, USA, 2015 reported that physical activity enormously improved abnormal glucose tolerance when caused by insulin resistance primarily than when it was caused by deficient amounts of circulating insulin.Charrokopou et al 2015 [28],.Second, physical activity is likely to be most beneficial in preventing the progression of T2DM during the initial stages, before insulin therapy is required. The protective mechanism of physical activity appears to have a synergistic effect with insulin. During a single prolonged session of physical activity, contracting skeletal muscle enhances glucose uptake into the cells. This effect increases blood flow in the muscle and enhances glucose transport into the muscle cell. Weinstein et al 2001[29],. Third, physical activity has also been found to reduce intra-abdominal fat, which is a known risk factor for insulin resistance. In certain other studies, physical activity has been inversely associated with intra-abdominal fat distribution and can reduce body fat stores. Cloe et al 1998 Lifestyle and environmental factors are reported to be the main causes of extreme increase in the incidence of T2DM. Davvies et al 2003 [30]

CONCLUSION

In conclusion, this analysis outlined the prevalent risk factors for hypertension and type 2 diabetes at Tabuk University, which were marginally high and could eventually contribute to the development of a severe disease over time. In particular, it was found that unhealthful diets and sedentary lifestyles were very prevalent among the sample community. In the current situation, there are relatively few health alerts that are enticing enough to draw population exposure to these risk factors. By start early with kids in school by provide them health education and also nurses can educate patients on the risk factors and complications of hypertension and diabetes. Instead more consumers need either commercials or posters for that lifestyle, and fast food, as well as the need to inspire them to lead a safe and productive life. Daily promotion activities in important public places and social media should be the standard, while effective regulatory methods should

be introduced at national level. Importantly, international coordination between countries on disease prevention and reducing risk factors should be a long-term priority.

REFERENCES

1. Ohishi, Mitsuru. "Hypertension with type 2 diabetes: physiology and pathology." Hypertension Research 41.6 (2018): 389-393.
2. Al-Nozha MM, Abdullah M, Arafah MR, Khalil MZ, Khan NB, Al-Mazrou YY, Al-Maatouq MA, Al-Marzouki K, Al-Khadra A, Nouh MS, Al-Harthi SS. Hypertension in saudi arabia. Saudi medical journal. 2007 Jan 1;28(1):77.
3. Anjana RM, Deepa M, Pradeepa R, Mahanta J, Narain K, Das HK, Adhikari P, Rao PV, Saboo B, Kumar A, Bhansali A. Prevalence of diabetes and prediabetes in 15 states of India: results from the ICMR–INDIAB population-based cross-sectional study. The lancet Diabetes & endocrinology. 2017 Aug 1;5(8):585-96.
4. Pan SC, Ku CC, Kao D, Ezzati M, Fang CT, Lin HH. Effect of diabetes on tuberculosis control in 13 countries with high tuberculosis: a modelling study. The lancet Diabetes & endocrinology. 2015 May 1;3(5):323-30.
5. Ahmed Syed Meraj MM. A study on the prevalence of risk factors for diabetes and hypertension among school children in Majmaah, Kingdom of Saudi Arabia. Journal of public health research. 2017 Sep 21;6(2).
6. Chincholikar S, Sohani A. Epidemiological determinants of obesity in adolescent population Maharashtra, India. Indian Journal of Community Health. 2016 Jun 30;28(2):157-62.
7. Beshara, A.; Cohen, E.; Goldberg, E.; Lilos, P.; Garty, M.; Krause, I. Triglyceride levels and risk of type 2 diabetes mellitus: A longitudinal large study. J. Investig. Med. 2016, 64, 383–387. [CrossRef]
8. Al-Kaabba, A.F.; Al-Hamdan, N.A.; El Tahir, A.; Abdalla, A.M.; Saeed, A.A.; Hamza, M.A. Prevalence and correlates of dyslipidemia among adults in Saudi Arabia: Results from a national survey. Open J. Endocr. Metab. Dis. 2012, 2, 89. [CrossRef]
9. Alqubali, H.F.; Albalawi, K.A.; Alswat, A.E.; Aljebreen, A.A.; Alotaibi, K.E.; Aljehani, A.S.; Almughamsi, R.A.; Hussain, A.M.; Albiek, H.F. Prevalence of Type 2 Diabetes Mellitus and Hypertension in Overweight and Obese People in Riyadh City, KSA 2017. Egypt. J. Hosp. Med. 2017, 69, 2614–2617. [CrossRef].
10. Murad, M.A.; Abdulmageed, S.S.; Iftikhar, R.; Sagga, B.K. Assessment of the Common Risk Factors Associated with Type 2 Diabetes Mellitus in Jeddah. Int. J. Endocrinol. 2014, 2014, 616145. [CrossRef].
11. Thelin, A.; Holmberg, S. Type 2 Diabetes and Lifestyle—A Prospective Population-Based Cohort Study among Rural Men. Int. J. Diabetes Clin. Res. 2014, 1, 2–5. [CrossRef].
12. World Health Organization—Department of Non-communicable Disease Surveillance. Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications: Report of a WHO Consultation; WHO: Geneva, Switzerland, 1999; Available online: https://apps.who.int/iris/bitstream/handle/10665/66040/WHO_NCD_NCS_99.2.pdf (accessed on 17 October 2019).
13. Alqurashi, K.A.; Aljabri, K.S.; Bokhari, S.A. Prevalence of Diabetes mellitus in a Saudi community. Ann. Saudi Med. 2011, 31, 19–23. [CrossRef] [PubMed].
14. James, P.A.; Oparil, S.; Carter, B.L.; Cushman, W.C.; Dennison-Himmelfarb, C.; Handler, J.; Lackland, D.T.; LeFevre, M.L.; MacKenzie, T.D.; Ogedegbe, O.; et al. 2014 Evidence-Based Guideline for the Management of High Blood Pressure in Adults: Report From the Panel Members Appointed to the Eighth Joint National Committee (JNC 8). JAMA 2014, 311, 507–520. [CrossRef] [PubMed].
15. American Diabetes Association. Standards of Medical Care in Diabetes. Diabetes Care 2014, 37 (Suppl. 1), S14–S80. [CrossRef] [PubMed].
16. Azimi-Nezhad, M.; Ghayour-Mobarhan, M.; Parizadeh, M.R.; Safarian, M.; Esmaeili, H.; Parizadeh, S.M.; Khodaee, G.; Hosseini, J.; Abasalti, Z.; Hassankhani, B.; et al. Prevalence of type 2 diabetes mellitus in Iran and its relationship with gender, urbanisation, education, marital status and occupation. Singap. Med. J. 2008, 49, 571–576.
17. Ansari, R.M. Effect of Physical Activity and Obesity on Type 2 Diabetes in a Middle-Aged Population. J. Environ. Public Health 2009, 2009, 195285. [CrossRef] [PubMed].
18. Lee, T.C.; Glynn, R.J.; Peña, J.M.; Paynter, N.P.; Conen, D.; Ridker, P.M.; Pradhan, A.D.; Buring, J.E.; Albert, M.A. Socioeconomic Status and Incident Type 2 Diabetes Mellitus: Data from the Women's Health Study. PLoS ONE 2011, 6, e27670. [CrossRef] [PubMed].
19. A. A. Saeed, N. A. Al-Hamdan, A. A. Bahnassy, A. M. Abdalla, M. A. F. Abbas, and L. Z. Abuzaid, "Prevalence, awareness, treatment, and control of hypertension among Saudi adult population: a national survey," International Journal of Hypertension, vol. 2011, Article ID 174135, 8 pages, 2011.View at: Publisher Site | Google Scholar
20. C. L. Craig, A. L. Marshall, M. Sjöström et al., "International physical activity questionnaire: 12-country reliability and validity," Medicine and Science in Sports and Exercise, vol. 35, no. 8, pp. 1381–1395, 2003.View at: Google Scholar
21. National Health and Nutrition Examination Survey (NHANES), Health Tech/ Blood Pressure Procedures Manual. [Internet], CDC, 2009, http://www.cdc.gov/nchs/data/nhanes/nhanes_09_10/BP.pdf
22. F. R. M. Causland, F. M. Sacks, and J. P. Forman, "Marital status, dipping and nocturnal blood pressure: results from the dietary approaches to stop hypertension trial," Journal of Hypertension, vol. 32, no. 4, pp. 756–761, 2014.View at: Publisher Site | Google Scholar
23. A. Lipowicz and M. Lopuszanska, "Marital differences in blood pressure and the risk of hypertension among Polish men," European Journal of Epidemiology, vol. 20, no. 5, pp. 421–427, 2005.View at: Publisher Site | Google Scholar
24. H. Alwan, M. Pruijm, B. Ponte et al., "Epidemiology of masked and white-coat hypertension: the family-based SKIPOGH study," PloS ONE, vol. 9, no. 3, Article ID e92522, 2014.View at: Google Scholar
25. Ministry of Health, Kingdom of Saudi Arabia Projected Population, 2013.
26. Institute for Health Metrics and Evaluation (IHME), Healthy Years Lost vs Life Expectancy, Saudi Arabia. Risk of Deaths. 1990–2010, University of Washington, Seattle, Wash, USA, 2013, http://www.healthmetricsandevaluation.org/gbd/visualizations/country.
27. Assy N, Nasser G, Kamayse I, Nseir W, Beniashvili Z, Djibre A, et al. Soft drink consumption linked with fatty liver in the absence of traditional risk factors. Can J Gastroenterol. 2008;22:811–6. [PMC free article] [PubMed] [Google Scholar]
28. Charokopou M, Sabater F, Townsend R, Roudaut M, McEwan P, Verheggen B. Methods applied in cost-effectiveness models for treatment strategies in Type 2 diabetes mellitus and their use in health technology assessments: A systematic review of the literature from 2008 to 2013. Curr Med Res Opin. 2015;32:1–12. [PubMed] [Google Scholar]
29. Weinstein MC, Toy EL, Sandberg EA, Neumann PJ, Evans JS, Kuntz KM, et al. Modeling for health care and other policy decisions: Uses, roles, and validity. Value Health. 2001;4:348–61. [PubMed] [Google Scholar]
30. . Davies R, Roderick P, Raftery J. The evaluation of disease prevention and treatment using simulation models. Eur J Oper Res. 2003;150:53–66. [Google Scholar]