Original Research Article

Prevalence and Correlation of Hypertension, Obesity and Diabetes Among Adults Visiting Community Based Screening Programs

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ABSTRACT

Introduction

According to the World Health Organization, diabetes, hypertension and obesity are one of the top five continuing risk factors for cardiovascular deaths in the world. Hypertension and obesity increase the risk of long-term vascular complications of type 2 diabetes mellitus. This study aims to find the prevalence and correlation of hypertension, obesity and diabetes among the adults in central part of Nepal.

Methods

An analytical cross-sectional study was conducted among 233 adults visiting the community based screening programs in Bharatpur-10, Nepal organized by College of Medical Sciences during July 2022 to August 2022. Descriptive analysis was done to find the frequency, percentage and mean. To find the association between continuous variables correlation was used (p-value <0.05).

Results

The mean age was 53.71±12.42 years, 60.9% males and 39.1% females. The prevalence of hypertension was found to be 25.7%, obesity was 21.8% and diabetes was 36.5%. The FBS was positively correlated with age, SBP, DBP and BMI. The correlation of FBS with age (p-value 0.05) and SBP (p- value 0.01) was found to be statistically significant.

Conclusions

The prevalence of hypertension, obesity and diabetes were found to be high both in male and female adults visiting the community based screening programs. Fasting blood glucose was found to be positively correlated with age, body mass index, systolic and diastolic blood pressure measurements of the patient. Thus, fasting blood sugar level increases with increasing age, increasing body mass index, increasing systolic and diastolic blood pressure levels of the patient.

Keywords: body mass index; diabetes mellitus; hypertension; fasting blood sugar; obesity; prevalence.

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INTRODUCTION

Diabetes Mellitus (DM) is classified as a metabolic disorder due to relative or absolute deficiency of Insulin hormone in the body. It is a major modifiable risk factor leading to premature death due to cardiovascular and cerebrovascular diseases.[1] According to the World Health Organization (WHO) recent update, diabetes, hypertension and obesity are one of the top five continuing risk factors for cardiovascular deaths in the world.[2] Hypertension and obesity increase the risk of long-term vascular complications of type 2 diabetes mellitus (T2DM), including stroke, chronic kidney disease, heart disease, peripheral vascular disease, and death.[3] Hypertension and obesity among patients with T2DM in developing countries are perhaps even more harmful than in high-income countries.[4]

The burden of diabetes has posed insurmountable challenges in both low and high income countries.[5] In 2019, approximately 463 million adults aged 20–79 years were living with diabetes worldwide, causing an estimated 1.5 million deaths.[6] This number is expected to rise to 700 million by 2045.[7] The burden of DM in terms of prevalence and number has risen dramatically, particularly in low-income and middle-income countries.[8] South Asia, the most populous region in the world, is home to nearly two-thirds of all global diabetes cases.[9] In 2017, nearly 10,145 deaths were attributed to diabetes, which was also ranked as the 11th most common cause of disability-adjusted life years (DALYs) in Nepal (1226 DALYs per 10,000 population).[10] In 2020, the prevalence of T2DM in Nepal was 8.5%, which was higher than that of 8.4% in 2014.[11] The prevalence of DM and related risk factors, including overweight and obesity, has increased across South Asia in recent decades. According to the International Diabetes Federation (IDF), an estimated 82 million adults aged 20–79 years were living with DM in the South East Asia Region in 2017, representing a regional prevalence of 8.5%.[12]

In the past 20 years, the rates of obesity have tripled in developing countries that have been adopting a Western lifestyle involving decreased physical activity and overconsumption of cheap, energy-dense food. Consequently, diabetes is rapidly emerging as a global health care problem that threatens to reach pandemic levels by 2030.[13]

The increase in rates in developing countries follows the trend of urbanization and lifestyle changes, including increasingly sedentary lifestyles, less physically demanding work and the global nutrition transition, marked by increased intake of foods that are high energy-dense but poor in nutrition. Within this escalating healthcare problem of monumental proportions, obesity-associated type 2 diabetes accounts for 90% to 95% of all diagnosed diabetes cases in adults.[14]

Blood pressure reduction has been associated with a decreased risk of T2DM-related complications, including death, stroke, and the need for retinal photocoagulation.[15] Weight loss helps correct insulin resistance and dyslipidemia found in patients with T2DM.[16] Recent recommendations from the American Diabetes Association (ADA) and the European Association for the Study of Diabetes note that aggressive management of cardiovascular risk factors, which include high blood pressure and obesity, may be even more beneficial in patients with T2DM because of their increased risk of cardiovascular morbidity and mortality.[17]

Knowing the proportion of the T2DM population at additional risk of complications from hypertension and obesity is an important public health measure to determine public and private resource requirements to reduce these risk factors or to care for patients after cardiovascular events. The study conducted

will help to determine the rates of hypertension, obesity and diabetes and their correlation among the adult population. This study aims to find the prevalence and correlation of hypertension, diabetes and obesity among the adults visiting community based health screening programs in central part of Nepal.

METHODS

An analytical cross-sectional study was conducted among 233 adults visiting the community based screening programs like screening clinics and health camps in Bharatpur-10, Nepal organized by College of Medical Sciences during July 2022 to August 2022. Sample size was determined by using the formula n= $(z^2 \times pq)/e^2$. The prevalence of type 2 Diabetes cases in Nepal is 8.5%.[18] So, considering p=0.085 and q=0.915. The z-score value at 95% Confidence interval is 1.96. The desirable error was 5%, the required minimum sample size of this study was 120. Non- probability (purposive) type of sampling technique was used to collect the data.

The informations were collected from the health records of all the adults of 18 years and above age and of those who visited the screening camp or clinic with at least 8 hours of fasting state. Blood Pressure (B.P) was measuredby using Sphygmomanometer and Stethoscope, Weight (wt) by using weighing scale, Height (ht) byusing Stadiometer and Fasting Blood Glucose (FBG) by using Glucometer. Hypertension was classified as Normal (<120/<80 mm of Hg), Pre-HTN (120-139 by 80-89 mm of Hg), Hypertension Stage I (140-159 by 90-99 mm of Hg) and Hypertension Stage II (≥160 by ≥100 mm of Hg) according to BP level.[18] Body mass index (BMI)was obtained by dividing weight (in kilograms) by the square of height (in meters) i.e. kg/m2. Obesitywas classified as Underweight (<18.5), Normal (18.5-24.9), Overweight (25-29.9), Obese Class I (30-30.9), Obese Class II (30-30.9) and Obese Class III (≥ 40) according to BMI.[19] Diabetes was classified as Normal (<100 mg/dl), Pre-diabetes (≥ 100 to <126 mg/dl) and Diabetes (≥126 mg/dl) according to FBS level.[20]

Ethical approval was taken from Institutional Review Committee of College of Medical Sciences (Ref. No. COMSTH-IRC 2022-090). Confidentiality of all data and informations were maintained throughout the study. The collected data was first checked for completeness and consistency. Different variables were coded, entered and analyzed by using SPSS version 16 software. The entered data were cleaned and edited before subsequent analysis. Descriptive analysis was done to find the frequency, percentage and mean. To find the association between continuous variables correlation was used (p-value <0.05).

RESULTS

Table1. Sociodemographic characteristics of the patients (n=233).

		Frequency	(%)
Age (years)	<35	12	5.2
	35-50	90	38.6
	51-65	93	39.9
	>65	38	16.3
	Mean ± SD	53.71± 12.42	
Gender	Male	142	60.9
	Female	91	39.1

Table 1 shows the sociodemographic characteristics of 233 adults. Out of total population, 39.9% of the patients belonged to 51 to 65 years age group and 38.6% belonged to 35 to 50 years age group with Mean ± SD of 53.71± 12.42 years. Gender wise there were more males (60.9%) than females (39.1%).

Table 2. Prevalence of Hypertension, Obesity and Diabetes (n=233).

		Total	Male	Female
Hypertension (BP)	Normal	83 (35.6%)	46 (32.4%)	37 (40.7%)
	Pre-HTN	90 (38.6%)	56 (39.4%)	34 (37.4%)
	Hypertension	60 (25.7%)	40 (28.16%)	20 (21.97%)
	Stage I	46 (19.7%)	28 (19.7%)	18 (19.8%)
	Stage II	14 (6%)	12 (8.5%)	2 (2.2%)
Obesity (BMI)	Underweight	3 (1.3%)	1 (0.7%)	2 (2.2%)
	Normal weight	56 (24%)	35 (24.6%)	21 (23.1%)
	Overweight	123 (52.8%)	78 (54.9%)	45 (49.5%)
	Obesity	51 (21.8%)	28 (19.7%)	23 (25.27%)
	Class I	45 (19.3%)	25 (17.6%)	20 (22%)
	Class II	5 (2.1%)	2 (1.4%)	3 (3.3%)
	Class III	1 (0.4%)	1 (0.7%)	0 (0.0%)
Diabetes (FBS)	Normal	64 (27.5%)	35 (24.6%)	29 (31.9%)
	Pre-diabetes	84 (36.1%)	49 (34.5%)	35 (38.5%)
	Diabetes	85 (36.5%)	58 (40.8%)	27 (29.7%)
Total		233 (100.0%)	142 (60.9%)	91 (39.1%)

Table 2 shows that among total 233 adults, the prevalence of hypertension was found to be 25.7%, obesity was 21.8% and diabetes was 36.5%. The prevalence of hypertension was found to be more in males (28.16%) than females (21.97%), prevalence of obesity was found to be more in females (25.27%) than males (19.7%) and prevalence of diabetes was found to be more in males (40.8%) than females (29.7%). The overall prevalence of pre-hypertension was found to be 38.6%, overweight was 52.8% and pre-diabetes was 36.1%. Prevalence of pre-hypetension and Overweight was more in males than females whereas prevalence of pre-diabetes was more in females (38.5%) as compared to males (34.5%).

Table 3. Gender wise mean and standard deviation of continuous variables.

Variable	Over All		Female		Male	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Age	53.71	12.42	55.51	12.79	52.56	12.09
SBP	123.86	14.46	122.87	15.14	124.49	14.02
DBP	79.40	11.03	77.89	9.69	80.38	11.74
BMI	27.19	3.94	27.40	4.15	27.06	3.81
FBS	129.20	48.78	128.68	57.52	129.53	42.46

Table 3 shows gender wise mean and standard deviation of continuous variables. The overall mean ± SD of age was 53.71±12.42 years. The mean age of females was 55.51±12.79 years and mean age of males was 52.56±12.09 years. The overall mean of Systolic Blood Pressure (SBP) was 123.86±14.46 mm of Hg. The overall mean of Diastolic Blood Pressure (DBP) was 79.40±11.03 mm of Hg. The overall mean ±SD of BMI was 27.19±3.94. The overall mean ±SD of FBS levels was 129.20±48.78.

36.1%. Likewise, Nshisso LD et al. found overall prevalence of hypertension was 19.1% (95%CI: 17.1–20.8) and 22% and 14.9% among men and women respectively. The overall prevalence of diabetes was 6.5% and 6.4% and 6.6% among men and women correspondingly.[22] Ghimire A et al. study showed 34% of the participants had hypertension, and 6.3% were diabetic. 28% were overweight, and 32% were obese. 22.5% of the participants had metabolic syndrome based on IDF criteria and 20.7%.[23]

Table 4. Correlation of FBS with Age, SBP, DBP and BMI.

		Age	SBP	DBP	BMI
FBS	Pearson Correlation	.131*	.239*	.030	.114
	p-value	.047	<.001	.651	.083

*statistically significant at 5% level of significance.

Table 4 shows the correlation of FBS with age, SBP, DBP and BMI all showed positive correlation. The correlation of FBS with age was found to be statistically significant at 0.05 level and with SBP was found to be statistically significant at 0.01 level. The correlation of FBS with DBP and BMI was not statistically significant.

DISCUSSION

There is unequivocal evidence that determination of the prevalence of DM risk factors such as hypertension and obesity is a very essential measure for creating and designing DM specialized care and management plans. In this study the mean age was 53.71± 12.42 years with 60.9% male adults. A study conducted by Mussa BM et al. showed the mean age was 55.6 years with 59% female patients.[21]

The overall prevalence of hypertension in our study was found to be 25.7%, obesity was 21.8% and diabetes was 36.5%. The overall prevalence of pre-hypertension was found to be 38.6%, overweight was 52.8% and pre-diabetes was

The present study found that the prevalence of hypertension was more in males (28.16%) than females (21.97%). Obesity prevalence was more in females (25.27%) than males (19.7%) and diabetes prevalence was higher in males (40.8%) than females (29.7%). Prevalence of pre-hypertension and overweight was more in males than females whereas prevalence of prediabetes was more in females (38.5%) as compared to males (34.5%). Similarly, Wijewardene et al. studied among 30 and 65 years of population and showed that the prevalence of hypertension as defined was 18.8% for men and 19.3% for women. The prevalence of diabetes was 14.2% for men and 13.5% for women while impaired fasting glycaemia was 14.2% for men and 14.1% for women. The mean body mass index was 21.5 kg/m2 (SD = 3.7) in men. It was lower than that in women, 23.3 kg/m2 (SD = 4.5). The prevalence of obesity was 20.3% in men and 36.5 % in women.[24]

Kabakov E et al found that the prevalence of hypertension was 60.2%, 76.5%, and 85.8% at blood pressure thresholds of 140/90, 130/85,

and 130/80 mm Hg respectively. Hypertension prevalence increased with age, reaching a rate of 94.4% in patients aged 80 years or more when the cutoff value of 130/80 mm Hg was used. At this cutoff, 93.3% and 86.6% of patients with a body mass index over or under 30 kg/m^2, respectively, were diagnosed with hypertension. As hypertension appears to eventually afflict the vast majority of diabetic patients, the minority of subjects not developing hypertension emerges as a unique group, which potentially deserves further in-depth study.[25]

Warsy AS et al conducted a household screening survey in five different areas of Saudi Arabia showed that the overall prevalence of diabetes mellitus was 9.7% and 7.0%, obesity 13.05% and 20.26%, overweight 27.23% and 25.20%, and hypertension 5.39% and 3.65% in the adult male and female populations respectively. A significant increase was observed in the prevalence of diabetes, obesity and hypertension with age in both males and females. In addition, the prevalence of obesity and overweight was significantly higher in the individuals with diabetes mellitus.[26]

Colosia AD et al. conducted a systematic review among 2,688 studies, 92 observational studies provided prevalence rates for hypertension and/ or obesity specifically in adults with T2DM. 44 reported obesity prevalence, and 12 reported the prevalence of hypertension with obesity. Most studies had a low risk of bias regarding diagnosis of T2DM, hypertension or obesity. The continental regions with the most observational studies of hypertension or obesity prevalence were Europe and Asia. Hypertension rates typically were high in all regions; most studies presented rates above 50%, and many presented rates above 75%. Obesity rates exceeded 30% in 38 of 44 studies and 50% in 14 of 44 studies, especially those assessing central obesity (based on waist circumference). Among obese adults,

hypertension rates were at or above 70% in Asia and above 80% in Europe; rates were lower in North and South America but still above 30%.[27]

Mussa BM et al. showed that the prevalence of hypertension and obesity in Emirati patients with type 2 DM were 63% and 57%, respectively. Compared to non-hypertensive patients, hypertensive patients with type 2 DM were older and had higher levels of HbA1C and about 60% of the hypertensive patients were obese. The prevalence of hypertension and obesity among Emirati patients with type 2 DM was significantly high.[21]

In the present study, the overall mean ±SD of BMI was 27.40±4.15 in women and 27.06±3.81 in men. In another study the mean body mass index was 23.3±4.5 in women and 21.5±3.7 in men.[22] In this study the overall mean of Systolic Blood Pressure (SBP) was 123.86±14.46 mm of Hg. The overall mean of Diastolic Blood Pressure (SBP) was 79.40±11.03 mm of Hg. In the study the overall mean ±SD of FBS levels was 129.20±48.78.

We found that the FBS showed positive correlation with age, SBP, DBP and BMI measurements of the adults. The correlation of FBS with age was found to be statistically significant at 0.05 level and with SBP was found to be statistically significant at 0.01 level. Thus, FBS level increases with increasing age, increasing BMI, and increasing SBP and DBP levels. Though, the correlation of FBS with DBP and BMI was not statistically significant. Similarly, Mussa BM et al. also founda strong positive relationship between the systolic blood pressure, and age and diabetes duration was observed whereas the diastolic blood pressure was negatively correlated with age and diabetes duration.[21] Hence, to decrease the burden of metabolic syndrome, prevention and control of all metabolic risk factors like obesity, hypertension and diabetes mellitus has

to be addressed by an integrated approach of the health care delivery system.

CONCLUSIONS

The prevalence of hypertension, obesity and diabetes were found to be high both in male and female adults visiting the community based screening programs. Metabolic risk factor like fasting blood glucose was found to be positively correlated with other risk factors like age, body mass index, systolic and diastolic blood pressure measurements of the patient. Thus, fasting blood sugar level increases with increasing age, increasing body mass index, increasing systolic and diastolic blood pressure levels of the patient.

ACKNOWLEDGEMENTS: We would like to thank the community medicine and community health services department of College of medical Sciences for conducting the community based screening programs and contributing to this research.

Conflict of interest: None.

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