



ORIGINAL RESEARCH ARTICLE

ASSOCIATION OF RANDOM BLOOD SUGAR WITH BODY MASS INDEX IN HABITANTS OF SUBURBAN KATHMANDU DISTRICT

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ABSTRACT

Background: Diabetes mellitus is increasing in alarming number world-wide. The main predisposing factor being daily lifestyle which leads to obesity and other complications. Early diagnosis and life style modification among high risk group can decrease the burden of disease. This study was done to find out the random blood sugar level and assess the relationships between body mass index (BMI), waist hip ratio (WHR) and random blood sugar among the study population.

Methods: A cross sectional study was done using retrospective data collected at the health camp conducted during month of October 2018. The study area was Nagarjun and Chandragiri municipalities of Kathmandu district. The data was analyzed using SPSS version 21. The chi square test was used to assess relation between BMI, WHR and Random blood sugar.

Results: The number of participants in this study was 274. Majority of the participants, (92.7%) had random blood sugar level 200mg/dl or less. Those having RBS of more than 200mg/dl were 7.3%. Among all participants, 16.06% were obese. Further the obese participants showed high waist hip ratio in 81.8% and 9.1% of them had moderate or low waist hip ratio. Further, 46 participants showed diabetic blood sugar level and were either overweight (39.13%) or obese (28.26%).

Conclusions: This study concluded that those who had diabetic blood sugar level or high waist hip ratio had increases BMI. So such screening and preventive programme should be further expanded and even at clinical level. Additionally, patients must be counseled the reason for measuring BMI and RBS and its application for their health promotion.

INTRODUCTION

Diabetes mellitus is major public health problem faced by world in 21st century. Prevalence of Diabetes mellitus is in rise throughout the world including developing countries.¹⁻⁴ Sedentary life style, obesity, unhealthy diet, high blood pressure are some of the major risk factors associated with diabetes mellitus type 2.³⁻⁵ Obesity is one of the major problem rising in low income countries like Nepal.⁵ With changes in food habit and urbanization, people are heading towards new epidemic of

non communicable disease. Complications of diabetes such as nephropathy, neuropathy, and retinopathy are not reversible. The burden from theses complications has huge effect among individuals, family members and hence society. Intervention at the early stage (pre-diabetic) is beneficial to prevent disease and its complications. This can be better addressed by reaching people through community based local programmes than simply confining to hospital based programmes. Using right tool in term of effectiveness and cost for the diagnosis is again central essence of any screening programme.^{6,7}

International Diabetes Federation (IDF) suggests that individual countries should plan “to develop and evaluate cost-effective methods, setting up specific diabetes risk identification and prevention strategies based on available resources.⁷ Measurement of body mass Index (BMI) , waist hip ratio and reading of random capillary blood sugar could be one of the simplest cost effective method. Reading the random blood sugar level by use of glucometer is one of the easy and reliable method of screening.^{8,9} The finding can be used to find high risk group and encourage people for early expert consultation for needed procedure. So, this study was done to assess the relation of high random blood sugar with BMI and WHR among people attending health camp for screening in suburban Kathmandu.

METHODS

A cross sectional study was done using retrospective data collected at the health camp conducted during month of October 2018. The study area covered two adjacent municipalities Nagarjun and Chandragiri. Selection of wards was according to the demand from locals. The camp was focused on general health checkup, screening for cervical cancer, high blood pressure, high blood sugar level, and general dental health checkup. Out of 300 participants for general checkup and blood sugar measurement, 274 participants were selected for the study. The inclusion criteria were age 25 years and above, without previous history of diabetes, hypertension or other chronic disease. Those participants who were recorded with fever or pregnancy during health camp were excluded from the study. Ethical clearance for the study was taken from Institutional research committee of KIST medical college and teaching hospital.

All the participants’ outcome was recorded in a register according to the municipality and ward to form a database in Community Medicine department. This study used this stored data to analyze the relation between BMI and random blood sugar. The study team recorded the required parameters from this database in

a proforma. The variables included were age, sex, and weight, and height, measurement of hip circumference and recording of random blood sugar. Random blood sugar was observed by using standard glucometer (Glucodr Auto) and the measurements were done by trained health experts. The reference values for a normal random glucose test in an average adult >200mg/dl is considered diabetes according to ADA guideline.¹⁰ For body weight measurement, same weighing machine is used for all the participants and is recorded nearest to 0.1 marks. Height is measured without shoes and making participant stand in front of the standard mark inscribed in wall. BMI classification¹¹ and Hip waist ratio¹² was measure as standard protocol.

For analysis, data was entered in Microsoft excel 2007 and analyzed in SPSS (Statistical package for social science) 21. Demographic data was presented in form of frequency and percentage. The chi square test was used to assess relation between BMI, WHR and Random blood sugar.

RESULTS

The total number of participants in this study was 274. Majority of them (69%) were female. The mean age of the participants was 44.92 years. Among the participants, 119 (43.4%) belonged to 60 years and above age groups and 71 (25.9%) were from age group below 40 years. (Table 1).

Table 1: Characteristics of participants

Characteristics	Frequency	Percentage
Age group		
Below 30	42	15.3
30-39	29	10.6
40-49	38	13.9
50-59	46	16.8
60 and above	119	43.4
Sex		
Male	85	31
Female	189	69

Majority of the participants (92.7%) had random blood sugar level 200mg/dl or less. Those having RBS of more than 200mg/dl were 7.3% (Table 2).

Table 2: Random blood sugar (RBS) level of the participants

Blood sugar (mg/dl)	Frequency	Percentage
Upto 200	254	92.7
>200	20	7.3

Among total participants, 113 (41.2%) were overweight and 44 (16.1%) were obese. Remaining 108 (39.4%) were within normal range and 9(3.3%) were reported as

Table 4: BMI and Random Blood Sugar level

BMI/RBS	Normal	Diabetes	p-value
Underweight	9(3.94%)	0(0%)	0.06
Normal	92(40.35 %)	15(32.61%)	
Overweight	95(43.48%)	18(39.13%)	
Obese	32(14.03%)	13(28.26%)	

Note: Diabetes denotes RBS >200mg/dl

The total 30(16.9%) participants with high waist hip ratio had random blood sugar of diabetic

underweight (Table 3).

Table 3: Body Mass index (BMI) of the participants

BMI	Frequency	Percentage
Underweight	9	3.3
Normal	108	39.4
Overweight	113	41.2
Obese	44	16.1

Majority of the participants with normal random blood sugar level were overweight (43.48%) and only 32(14.03%) were obese. Among Diabetes, 18(39.13%) were overweight and 13(28.26%) were obese. (Table 4)

level whereas 148 (83.1%) had normal blood sugar level. (Table 5).

Table 5: Waist Hip ratio (WHR) And Random Blood Sugar level (RBS)

WHR/RBS	Normal	Diabetes	p-value
Low	47(85.5%)	8(14.5%)	0.81
Moderate	33(80.5%)	8(19.5%)	
High	148(83.1%)	30(16.9%)	

Note: Diabetes denotes RBS >200mg/dl

DISCUSSION

Diabetes mellitus type 2 is rising in developing countries. Now, it is known fact that various modifiable risk factors such as food habit, obesity and sedentary life style is found to be associated with type 2 diabetes.⁷ The other fact is that all the non communicable diseases reported are only tip of iceberg. To improve the health of country, it is necessary to explore and expose the hidden burden of diseases and follow the principle of prevention is better than cure. This study represented the population residing at urban Nepal. The sample population included in this study belonged to wide range of age group starting from 20 years and above

of both sex. With shifting paradigm of disease pattern worldwide, coverage of extensive age group, reveals blood sugar level as well as BMI and waist hip ratio of wider population.

In our study, 6 participants of 40 years or below have random blood sugar level at diabetic level. Though the number seems to be small, every single person detected and referred for referral for further diagnostic tests plays vital role in healthy population. A study done by Liu AY et al reported that there was 40-60% risk reduction for 5-7% body weight loss in overweight population with IGT.¹³ In our study it was seen that majority of the participants

who had diabetic blood sugar level were either overweight (39.13%) or obese (28.26%). This result supports the evidence from other studies that high body weight is risk factor for diabetes mellitus.¹⁴⁻¹⁷ A study conducted by Onyesom Innocent et al showed that there was weak correlation between BMI and blood glucose levels among the male subjects while female subjects showed positive and strong (significant) correlation.¹⁴

In this study, 36 (83.1%) participants with high WHR ratio had normal blood sugar level whereas 30 (16.9%) had high blood sugar level. The association between WHR and Random blood sugar was not significantly associated. This result was accordance to the report of WHO, 2008 which stated though studies done worldwide provided evidence that either BMI or waist circumference predicted an association with diabetes, and an increased risk of the disease, independent of other factors, but its applicability was doubted as tool for first step diagnosis.¹ The findings of this study suggested that for screening purpose, waist hip ratio had least applicability while those who had blood sugar level have high waist hip ratio.^{18,19}

During Health camp, all the participants were counseled regarding BMI and hip waist ratio and blood sugar level. Out of 46 participants who recorded high blood sugar, all the participants were advised for follow up in health centers for needed interventions if any. Three of them contacted our focal person at interval of one week and confirmed their diagnosis of diabetes mellitus type -2 after expert consultations. Two of them were overweight and one was normal weight. This further adds proof that routine BMI and blood sugar recording can be beneficial for early diagnosis and treatment.

CONCLUSION

This study concluded that those who had diabetic blood sugar level or high waist hip ratio had increases BMI. In addition, follow up of the patients after camp can further support the association between high blood sugar and BMI in such set up. Furthermore, patients must be counseled about necessity of measuring BMI and RBS.

REFERENCES

1. Diabetes. World health organisation 30 October 2018; [online citation] Available From: <https://www.who.int/news-room/fact-sheets/detail/diabetes>
2. Zheng Y, Ley SH and. Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nature Reviews Endocrinology* 2017 Dec ;14:88-98 Available From: <https://www.ncbi.nlm.nih.gov/pubmed/29219149>
3. About Diabetes. International Diabetes Federation. [online citation] Available From: <https://www.idf.org/aboutdiabetes/what-is-diabetes/risk-factors.html>
4. Silva EFF, Ferreira CMM, Pinho LD. Risk factors and complications in type 2 diabetes outpatients. *Rev. Assoc. Med. Bras* 2017 Jul; 63 :7 Available From: <http://dx.doi.org/10.1590/1806-9282.63.07.621>
5. Gyawali B, Sharma R, Neupane D, Mishra SR, Teijlingen EV, Kallestrup P. Prevalence of type 2 diabetes in Nepal; a systemic review and metaanalysis from 2000 to 2014. *Global Health Action* 2015;8 Available From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4662667/>
6. Gilmer TP, O'Connor PJ. The Growing Importance of Diabetes Screening Diabetes Care. 2010 Jul; 33(7): 1695–1697 Available From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2890385/>
7. Chajewski OS, Nichols JH. The importance of testing for pre-diabetes—using the right tool. *US Endocrinology* 2009;5(1):22-25 Available From: <https://www.touchendocrinology.com/the-importance-of-testing-for-pre-diabetes-using-the-right-tool/>
8. Simmons RK, Unwin N, Griffin SJ. International Diabetes Federation: An update of the evidence concerning the prevention of type 2 diabetes. *Diabetes Res Clin Pract.* 2010;87(2):143–149. Available From: [https://www.diabetesresearchclinicalpractice.com/article/S0168-8227\(09\)00428-8/fulltext](https://www.diabetesresearchclinicalpractice.com/article/S0168-8227(09)00428-8/fulltext)

9. Muktabhant B, Sanchaisuriya P, Sarakrn P, Tawityanon W, Trakulwong M, Worawot S et al. Use of glucometer and fasting blood glucose as screening tools for diabetes mellitus type 2 and glycated haemoglobin as clinical reference in rural community primary care settings of a middle income country. *BMC Public Health* 2012; 12: 349 Available From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3403882/>
10. Diagnosing Diabetes and Learning About Pre-diabetes. American diabetes association 2016 Nov; Available From: <http://www.diabetes.org/diabetes-basics/diagnosis/>
11. Body Mass Index. World Health Organization. Available From: <http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi>
12. Chen Y, Zhang XP, Yuan J, Cai B, Wang XL, Li Wu X, et al . Association of body mass index and age with incident diabetes in Chinese adults: a population-based cohort study. *BMJ Open* 2018; 8:e021768. Available from: <https://bmjopen.bmj.com/content/bmjopen/8/9/e021768.full.pdf>
13. Kundap RP, Vidhate KB, Fernandez K. Assessment of Prevalence of Diabetes Among Rural Population of Pune District, India. *National Journal of Community Medicine* 2015 Apr-Jun; 6(2):385-389 Available From: http://njcmindia.org/uploads/6-3_385-389.pdf
14. Waist Circumference and Waist-Hip Ratio Report of a WHO Expert Consultation Geneva. WHO 2008 Dec; Available From: https://apps.who.int/iris/bitstream/handle/10665/44583/9789241501491_eng.pdf?ua=1
15. Liu AY, Silvestre MP, Poppitt SD. Prevention of type 2 Diabetes through life style modification: Is There a Role for Higher-Protein Diets? *Adv Nutr* 2015 Nov; 6(6): 665–673. Available From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4642418/>
16. Innocent O, Thank God O, Etumah, Sandra O, Josiah IE. Correlation between body mass index and blood glucose levels among some Nigerian undergraduates. *Research gate* 2013 Jan; Available From: https://www.researchgate.net/publication/289246702_Correlation_between_body_mass_index_and_blood_glucose_levels_among_some_Nigerian_undergraduates
17. Agrawal N, Agrawal MK, Kumari T, Kumar S. Correlation between Body Mass Index and Blood Glucose Levels in Jharkhand Population. *International Journal of Contemporary Medical Research*. 2017 Aug ;4(8):1633-1636 Available From: https://www.ijcmr.com/uploads/7/7/4/6/77464738/ijcmr_1592.pdf
18. Bakari AG, Onyemelukwe GC, Sani BG, Aliyu IS, Hassan SS, Aliyu TM. Relationship between random blood sugar and body mass index in an African population. *Int J Diabetes Metab*. 2006;14:144–5 Available From: https://www.researchgate.net/publication/237621580_Relationship_between_random_blood_sugar_and_body_mass_index_in_an_African_population
19. Panagiotakos DB, Pitsavos C, Chrysohoou C, Rivas G, Kontogianni MD, Zampelas A, et al. Epidemiology of overweight and obesity in a Greek adult population: the ATTICA Study. *Obes Res*. 2004;12:1914–1920. Available From: <https://www.ncbi.nlm.nih.gov/pubmed/15687390>