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## Body Mass Index Vs Waist Hip Ratio In Type 2 Diabetic Population And Its Correlation With Duration Of Diabetes

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### ABSTRACT

Diabetes mellitus, has become the global epidemic of the century. Increased Body mass index and waist hip ratio are known risk factors for the disease and they are known to increase the risk of heart disease and associated complications. To assess and compare the status of BMI and Waist hip ratio in type 2 diabetics and its correlation with duration of diabetes. This study comprised of 70 subjects who were aged above 30 years, with a past history of diabetes mellitus. The waist circumference, hip circumference and height and weight were measured. Out of the 70 diabetic patients, 44% had an abnormal BMI (more than 25 BMI) and 61% people had an abnormal waist hip ratio (ratio of more than 1). 32% people had abnormality of both. Altogether a total of 73% people had either abnormal BMI or W/H ratio, out of which 62% had been diagnosed with diabetes less than 2 years ago and 10% had been diabetic for more than 10 years. Waist hip ratio appears to be a more sensitive predisposing factor for diabetes compared to BMI. There seems to be a decline in BMI and W/H ratio with increase in duration of diabetes, with the highest values in the group of less than 2 years of diabetes and lowest values in those with more than 10 years of diabetes. This indicates that BMI and W/H ratio are definitely risk factors for diabetes and WHR, a definite indicator for occurrence of diabetes.

**Keywords:** Diabetes, BMI, W/H ratio.

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**INTRODUCTION**

There are numerous theories to suggest the exact cause and mechanism of Type 2 Diabetes. Central obesity is known to predispose individuals for insulin resistance. Abdominal fat is especially active hormonally, secreting a group of hormones called adipokines that may possibly impair glucose tolerance [1][2]. Visceral and central abdominal fat and waist circumference show a strong association with type 2 diabetes[3].

India is experiencing an epidemic of type-2 diabetes and related disorders [4][5]. A higher waist-to-hip ratio, which can be due to a higher waist circumference, a lower hip circumference, or both, is associated with higher glucose levels and incident diabetes [6]. As a health hazard, obesity has been linked to numerous metabolic complications such as dyslipidaemia, type 2 diabetes, and cardiovascular disease (CVD) [7].

The term “diabesity” has been coined [10,11] to emphasize the close relationship between these two diseases. Many anthropometric measurements have been used as indicators of obesity, out of which Body Mass Index (BMI) and Waist Hip Ratio (WHR) are most commonly used. Prospective studies have shown these two indicators as predictors of type 2 diabetes. [14,15]. They are also known predictors for risk of cardiovascular disease. [16,17]. Therefore, combined, we can assume that BMI and WHR could be indicators of CVD in type 2 diabetics. While most of the previous studies concentrate on assessing BMI and WHR in a normal population to evaluate their risk for diabetes, this study was conducted in a diabetic population to prove whether WHR and BMI had been the predisposing factor for their acquisition of the disease.

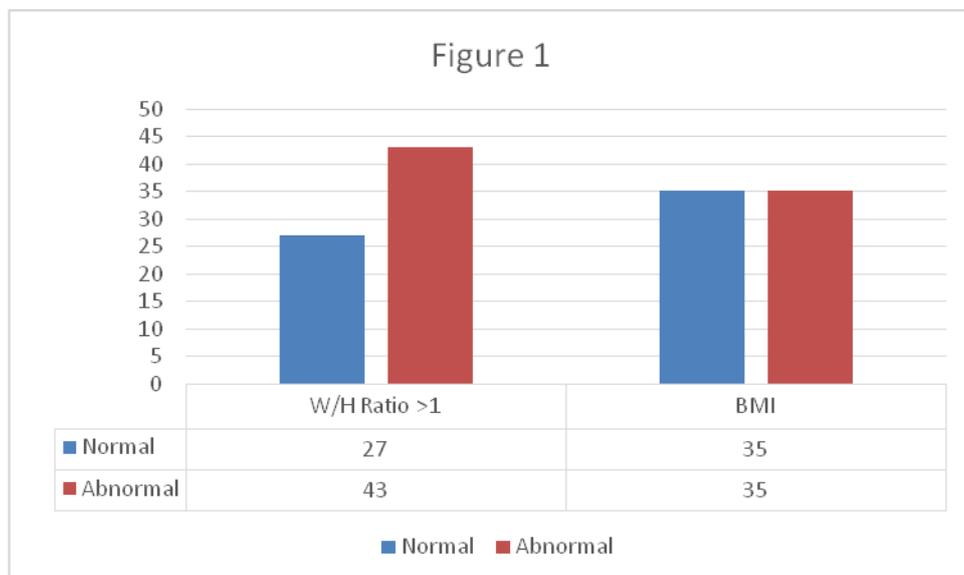
**MATERIALS AND METHODOLOGY**

This study comprised of 70patients who were, aged above 30 years, with a past history of diabetes mellitus and on regular treatment. Ethical clearance was obtained from the institution. Informed consent was also obtained from each subject. The history of diabetes mellitus was noted down by oral questioning.

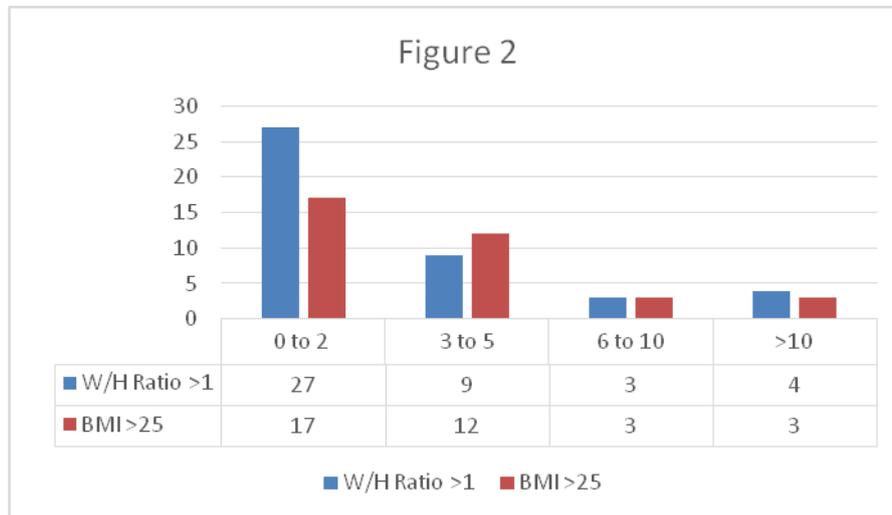
By using a measuring tape, the waist circumference was measured at the level which was midway between the lowest rib margin and the iliac crest, the hip circumference at the widest level over the trochanters. WHR was calculated by dividing the waist circumference by the hip circumference. The statistical analysis was done by Pearson’s correlation by using the SPSS software package (version 15.0).

**RESULTS**

According to the WHO criteria, we classified patients with BMI more than 25 as abnormal BMI, which included overweight and obese patients and WHR more than 1 as abnormal WHR. Out of the 70 diabetic patients, 35 people had an abnormal BMI and 43 people had an abnormal waist hip ratio as evident from Figure1.



We correlated the abnormal values with duration of diabetes and divided them into groups of 0-2years, 3-5years, 6-10years and more than 10 years. Figure 2 represents the correlation. It clearly shows a trend of declining BMI and WHR with increase in duration of diabetes. Considering abnormal WHR first, we found that a maximum of 27 people belonged to 0-2-year group and a minimum of 3 people belonged to 6-10years group. Similarly, for abnormal BMI, a maximum of 17 people belonged to 0-2-year group and a minimum of 3 people belonged to more than 10 year group.



### DISCUSSION

BMI and WHR have their own drawbacks as indicators of obesity. BMI cannot differentiate between total body fat and abdominal fat as it takes into account height and weight of a person; and an athlete with high protein mass would also be categorized as obese under BMI. Whereas, WHR shows great variations with gender, age, and ethnicity. [12,13].

The correlation of abnormal BMI and abnormal WHR with increasing duration of diabetes shows a declining trend in our study. Patients with history of 0-2 years of diabetes show increased abnormal BMI and abnormal WHR. Patients with history of diabetes more than 6 years duration have relatively normal BMI and WHR. This suggests that increased BMI and WHR had indeed been a predisposing factor for incidence of diabetes. The declining trend in BMI and WHR in patients with history of more than 6 years duration of diabetes can be attributed to fair control in blood sugar levels since all the patients subjected to this study were regular on treatment and following life style modifications. This pattern of data supports the results of previous studies.

### CONCLUSION

In this study, waist hip ratio appears to be more sensitive predisposing factor for incidence of diabetes compared to body mass index, since BMI in 35 people falls under normal category but there is increased WHR in 43 people. There is a decline in BMI and W/H ratio with increase in duration of diabetes, with the highest values in the group of less than 2 years of diabetes and lowest values in those with more than 10 years of diabetes. This can be attributed to life style modifications and compliance with treatment. Hence retrospectively, since WHR is a sensitive indicator of incidence of diabetes, people with increased WHR not yet diagnosed with diabetes can be advised for life style modifications to prevent the incidence of type 2 diabetes.

### REFERENCES

[1] Ghoshal, Kakali (2015). "Adiponectin: Probe of the molecular paradigm associating diabetes and obesity". World Journal of Diabetes 6 (1): 151–66.doi:10.4239/wjd.v6.i1.151. PMC 4317307. PMID 25685286.

- [2] Jump up^Darabi, Hossein; Raeisi, Alireza; Kalantarhormozi, Mohammad Reza; Ostovar, Afshin; Assadi, Majid; Asadipooya, Kamyar; Vahdat, Katayoun; Dobaradaran, Sina; Nabipour, Iraj (2015). "Adiponectin as a Protective Factor Against the Progression Toward Type 2 Diabetes Mellitus in Postmenopausal Women". *Medicine* 94 (33): e1347. doi:10.1097/md.0000000000001347. PMC 4616451. PMID 26287420.
- [3] Anjana, M.; Sandeep, S.; Deepa, R.; Vimalaswaran, K. S.; Farooq, S.; Mohan, V. (2004). "Visceral and Central Abdominal Fat and Anthropometry in Relation to Diabetes in Asian Indians". *Diabetes Care* 27 (12): 2948–53. doi:10.2337/diacare.27.12.2948. PMID 15562212.
- [4] Bhat DS, Yajnik CS, Sayyad MG, Raut KN, Lubree HG, Rege SS et al. Body fat measurement in Indian men: comparison of three methods based on a two-compartment model. *Int J Obesity* 2005; 29: 842-848.
- [5] Ramaiya KL, Kodali VR, Alberti KGMM. Epidemiology of diabetes in Asians of Indian subcontinent. *DiabMetab Rev* 1990; 6: 125146.
- [6] Snijder MB, Dekker JM, Visser M, Bouter LM, Stehouwer CDA, Kostense PJ et al. Associations of hip and thigh circumferences independent of waist circumference with the incidence of type 2 diabetes: the Hoorn Study. *Am J Clin Nutr* 2003; 77:1192-1197.
- [7] Bray GA, Bouchard C and James WPT, eds. *Handbook of obesity*. New York: Marcel Dekker. 1998.
- [8] Ford ES, Williamson DF and Liu S. Weight change and diabetes incidence: findings from a national cohort of US adults. *Am J Epidemiol* 1997; 146: 214-22.
- [9] World Health Organization, *Obesity and overweight*. Facts. World Health Organization. Available at: <http://www.who.int/dietphysicalactivity/media/en/gsf Obesity.pdf>. 2004.
- [10] Astrup A and Finer N. Redefining type 2 diabetes: 'diabesity' or 'obesity dependent diabetes mellitus'? *Obes Rev* 2000; 1: 57-9.
- [11] Shafrir E. Development and consequences of insulin resistance: lessons from animals with hyperinsulinaemia. *Diabetes Metab* 1996; 22: 122-31.
- [12] Waist Circumference as the Best Predictor of Noninsulin Dependent Diabetes Mellitus (NIDDM) Compared to Body Mass Index, Waist/hip Ratio and Other Anthropometric Measurements in Mexican Americans A 7-Year Prospective Study Ming Wei, Sharon P. Gaskill, Steven M. Haffner, Michael P. Stern
- [13] Waist circumference and not body mass index explains obesity-related health risk1–3 Ian Janssen, Peter T Katzmarzyk, and Robert Ross
- [14] Sensitivity and Specificity of Anthropometrics for the Prediction of Diabetes in a Biracial Cohort Dr. June Stevens1,2,\* , David Couper3, James Pankow2, Aaron R. Folsom4, Bruce B. Duncan5, F. Javier Nieto6, Daniel Jones7 and Herman A. Tyroler2
- [15] Comparison of Body Mass Index, Waist Circumference, and Waist/Hip Ratio in Predicting Incident Diabetes: A Meta-Analysis Gabriela Vazquez1, Sue Duval1, David R. Jacobs Jr.1 and Karri Silventoinen2
- [16] Waist circumference, waist–hip ratio and body mass index and their correlation with cardiovascular disease risk factors in Australian adults M. Dalton1, A. J. Cameron1, P. Z. Zimmet1, J. E. Shaw1, D. Jolley2, D. W. Dunstan1, T. A. Welborn3 and On behalf of the AusDiab steering committee1
- [17] Association between simple anthropometric indices and cardiovascular risk factors. Ho SC1, Chen YM, Woo JL, Leung SS, Lam TH, Janus ED.