Obesity: A Risk Factor of Diabetes Mellitus Type 2 among Women of Different Religions in an Urban Area of Ajmer

Laxmi Kumari Yadav[1], Bharti Prakash[2]

[1]Lecturer, Department of Zoology, S.P.C. Government College Ajmer

[2]Lecturer, Department of Zoology, S.P.C. Government College Ajmer

Abstract: *It has been estimated that India has the second largest number of diabetes in World and the incidence is rising. Women are equally prone to diabetes because of their sedentary activity and increased body weight. This study attempts to examine whether increased body mass index is associated with Diabetes Mellitus Type 2 in women of different religions of Ajmer urban area. The study was conducted on 162 newly detected type 2 diabetic females of different religions attending out patients in Department of Biochemistry, JLN Medical Hospital, Ajmer from March2015 to March 2016.Diagnosis of diabetes type 2 were screened from IGT (Impaired Glucose Tolerance) as per WHO criteria. Data tabulated and analyzed by Pearson Correlation coefficient has been used to estimate the relationship of BMI with diabetes mellitus type2. The respondent rate of women was 81 percent. After calculating the percentage, mean, standard deviation and correlation in different age group, religion and BMI of women suffering with diabetes.. Obesity (BMI) $\pm 31.2 \pm 0.48$ kg/m^2 in women were positively associated with Diabetes Type 2 (r=0.47). The onset age of diabetes is found to be 53.9$\pm$ 9.7 Yrs. Religion wise analysis shows that Sikh were strongly affected with diabetes by both obesity (r=0.92) and age (r=0.70). Jain and Christian were highly associated with obesity(r=0.87) and (r=0.79) respectively. Sindhi were moderately (r=0.42) affected by obesity. Hindu and Muslim were less affected by both obesity(r=0.20) and (r=0.23) respectively. The risk of diabetes is significantly correlated with BMI. The association between incidence of diabetes with age and obesity in various religions, it was found that risk of diabetes increase dramatically with as the age and obesity increases. It was concluded that in women diabetes mellitus type 2 was significantly positively correlated with obesity.*

Keywords: Obesity, Body Mass Index (BMI), Diabetes Mellitus Type 2 (DMT2), Impaired Glucose Tolerance (IGT).

1. Introduction

Diabetes mellitus is most common non communicable chronic metabolic disorder caused by the relative insufficiency of insulin secretion and insulin action. Diabetes becomes a real problem of developed and developing countries like India, where because of its diversity, prevalence is increasing steadily in different communities. India has earned with the world second largest number of diabetic subjects earning the dubious distinction of being termed the "Diabetic Capital of the World" [1].

An estimated 366 million adults aged 20-79 years has diabetes; this number is predicted to rise to 552 million by 2030 worldwide. Most people having diabetes are between 40 and 60 years old in low and middle income countries. [2] The risk factor of diabetes is age and obesity. The rising prevalence of obesity in developing countries is largely due to rapid urbanization and mechanization. Obesity is associated with increased risk of metabolic syndrome Type 2 DM. Consumption of high calories diet has become a common practice in our society. In India women are overweight by 1.37 times than men.[3]
Socio demographic factors associated with obesity include being married, education, religion caste, occupation, living standard and number of children ever born. People with severe obesity are at greater risk of type 2 diabetes than obese people with a lower BMI.

The present study is to provide the information about the association of obesity and incidence of diabetes mellitus Type 2 in different religions of Ajmer in support of women health.

2. Aim

The aim of this study is to describe the relationship between Diabetes mellitus Type 2 with age and obesity in women of different religion of Ajmer urban area. Obesity and diabetic condition of women is a major health challenge in small city of Ajmer Rajasthan India.

3. Method and Methodology

The present work is a part of study designed to assess "*An epidemiological study of diabetes type 1 and type 2 in urban population of Ajmer*". This is the study of newly detected type 2 diabetic women attending outpatient (OPD) especially consultations of Department of Biochemistry, JLN Medical college, Ajmer. A total of 200 diabetic women of all age groups were invited to participate in the study but only 162 were agreed to sign a written consent of all related aspect and outcomes. The approval was obtained by the ethical board of the JLN Medical College, Ajmer (Raj).

For the collection of information a baseline questionnaire was phrased for obtaining socio demographic status age, religion, past history, family history, diet pattern, physical activity, occupation, and socio-economic status.

Anthropometric measurements, height, weight (BMI) of each participant was recorded.

Body mass index is defined as the individuals body weight divided by the square height (kg/m^2). Women with BMI range 25 to 30 kg/m^2 were considered to be overweight and obese.

Classification and diagnosis criteria of Diabetes Mellitus Type 2 was done on the basis of WHO (1999), according to which FPG ≥110mg/dl and ≤126mg/dl are Impaired Fasting Glucose, FPG ≥126 mg/dl are diabetic and after 2hrs post load glucose PPG ≥ 140mg/dl and ≤ 200 mg/dl are Impaired Glucose Tolerance and ≥200mg/dl are diabetic [3]

4. Analysis

Entire data was entered in excel spreadsheet by masking personal identity of each respondent. Mean and standard deviation (SD) were calculated for each suitable studied variable. Pearson product moment correlation coefficient (PMCC) is used to establish the association between diabetes and BMI.

Table 1: BMI and Age specific distribution and association in Type 2 Diabetic women of Ajmer urban area

Sr. No	BMI Range (Kg/M2)	Incidence & %	Mean & SD of BMI	Correlation of respondent & BMI
1	< 18.5 Thin	0 – 0%	0.00±1.91	
2	18.5-24.99 Normal	20-12%	21.30±1.34	
3	25-29.99 Over Weight	46-28%	28.04±1.34	0.47
4	30-34.99 Obese I	51-31%	31.20±0.48	
5	35-39.99 Obese II	33-20%	36.06±0.97	
6	≥ 40 Obese III	12-7%	43.00±3.31	

| Sr. No	Age Group	Incidence & %	Mean and SD of Age	Correlation of respondent & Age
1	20-30	1 – 1%	25.00±0.00	
2	31-40	15- 9%	37.80±2.70	
3	41-50	45-28%	46.73±2.84	0.26
4	51-60	32-39%	55.87±2.94	
5	61-70	31-19%	64.60±3.12	
6	71 & Above	8-5%	73.87±2.58	
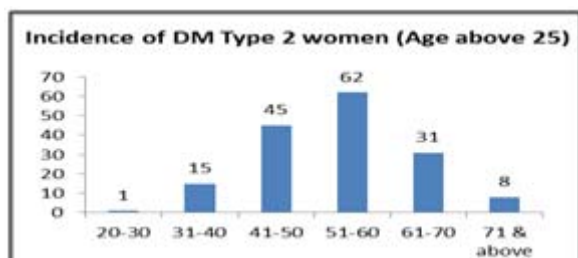
Figure 1: Incidence of DM Type 2 women
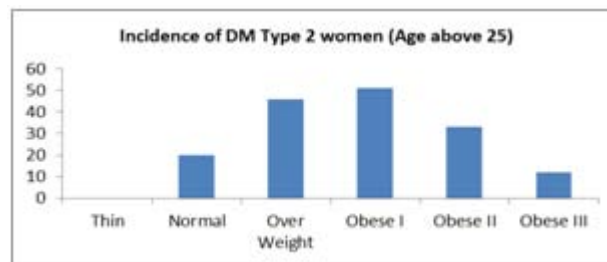
**Figure 2:** Incidence of DM Type 2 women

Table 2: Religion wise distribution and association of age group and BMI in Type 2 Diabetic women of Ajmer urban area

BMI Range	Mean BMI	Incidence of Diabetic Women in Different Religion					
		Hindu	Muslim	Christian	Shikhs	Jain	Sindhi
< 18.5 Thin	0.00	0	0	0	0	0	0
18.5-24.99 Normal	21.30	12	4	0	1	1	2
25-29.99 Over Weight	28.04	29	6	3	1	2	5
30-34.99 Obese I	31.21	30	8	2	3	2	6
35-39.99 Obese II	36.06	20	8	1	0	2	2
≥ 40 Obese III	43.00	10	2	0	0	0	0
Correlation Coefficient		0.20	0.23	0.78	0.92	0.86	0.40

| Age Group	Mean Age	Incidence of Diabetic Women in Different Religion					
		Hindu	Muslim	Christian	Shikhs	Jain	Sindhi
20-30	25.0	0	1	0	0	0	0
31-40	37.8	9	4	0	0	0	2
41-50	46.7	29	10	2	0	2	2
51-60	55.9	39	8	2	2	4	7
61-70	64.6	20	2	2	2	1	3
71 & Above	73.9	4	3	0	1	0	1
Correlation Coefficient		**0.25**	**0.07**	**0.31**	**0.70**	**0.19**	**0.31**
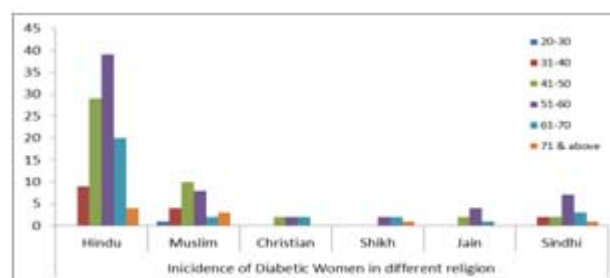
Figure 3: Incidence of Diabetic women in different religion
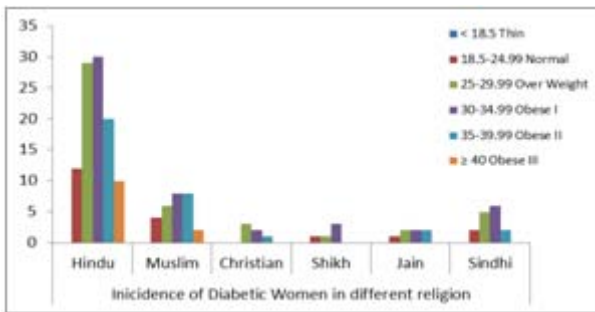
Figure 4: Incidence of Diabetic women in different religion

Table 3: Mean age and BMI distribution of Type 2 Diabetic women in different religion of Ajmer

Sr. No	Religion	Incidence & %	Mean & SD of Age	Mean & SD of BMI
1	Hindu	101 –62%	53.72 ± 9.33	31.22 ± 5.88
2	Muslim	28 – 17%	51.46 ± 11.74	31.39 ± 6.30
3	Christian	6 – 4%	57.83 ± 7.22	30.22 ± 2.81
4	Sikhs	5 – 3%	63.20 ± 6.38	28.74 ± 4.06
5	Jain	7 – 4%	55.00 ± 6.57	30.30 ± 5.60
6	Sindhi	15 - 9%	54.29 ± 10.52	29.57 ± 4.40
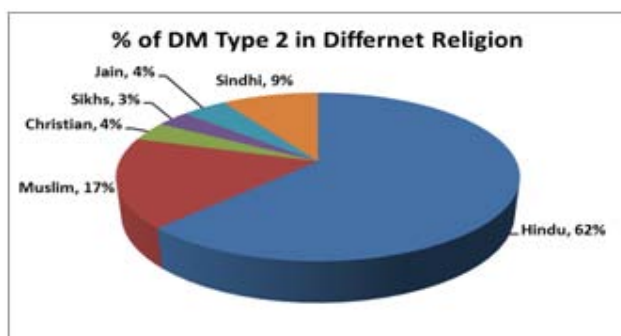
Figure 5: % of DM Type 2 in different religion

5. Result

Out of 200 diabetic women only 162 (81%) were respondent of this study. (Figure 5)The ratio of respondent in different religions was Hindu (62%), Muslim (17%), Sikh (5%), Christian (6%), Jain (7%) and Sindhi (9%). (Table 3)

The mean age of Diabetes Type 2 in women of Ajmer city was 53.92±9.75 yrs. For the detailed analysis age was grouped into categories 20-30 to above 71 years at the interval of 10 yrs. (Figure 1) Largest number of diabetic women are falling in the age group of 50-60 (38%) with mean age 55.87±2.94 and lowest 1% with 25.Table-1 As we calculated the obesity, (Figure 2) 33(20%) diabetic women are in the range of obese class II (35-40kg/m2), No women was underweight, 12(7%) were in obese class III (<40). Highest 51 (31%) diabetic women were falling in obese class1 (BMI >30mg/m^2). (Table 1)

After analyzing the association in incidence of diabetes with age and obesity in various religions in detail,(Table-2) it was found that risk of diabetes increase dramatically with the age and obesity. Religion wise analysis shows that Sikh were strongly affected with diabetes by both obesity (r=0.92) and age (r=0.87).Diabetes in Jains is highly correlated by obesity(r=0.87) but very less by age(r=0.17). Christians are found to be highly affected by obesity(r=0.79) than

age(r=0.29).Sindhi were moderately affected by obesity(r=0.41) and less with age(r=0.29).Hindu were less affected by both obesity(r=0.20) and age(r=0.22) and Muslims are less affected by obesity(r=0.23) and also very less by age(r=0.03). The risk of diabetes is significantly correlated with age and BMI. (Figure 3 and 4)

Age onset diabetes was greatest in Sikh and lowest in Muslim women, 63.20±6.38 and 25.69±3.93 respectively followed by Christian (57.17±7.27), Jain (55.14±6.5), Sindhi (54.8±10.4) and Hindu women (53.8±9.2). Mean value of BMI in Sikhs, Sindhi, Christian, Jain, Hindu and Muslim women were 28.74±4.06, 29.57±4.40, 30.22±2.81, 30.30± 5.60, 31.22±5.88 and 31.39±6.30 Kg/m2 respectively.(Table- 3)

6. Discussion

Our result is consistent with other studies that have examined the association between BMI and risk of diabetes. Similar findings were reported by various researches in India regarding female prepoandence in Indian diabetes by Venketesham et al and Ramachandran et al. Their study depicted that sedentary occupational habits are decreased physical activities are accompanied with the process of modernization which has resulted in doubling of the prevalence of obesity and Type 2D Diabetes in Indian population.[5] A study by Deepashree BN et al. suggests that obesity may function as a predisposing factor of type 2 diabetes. [6] Jain M. et al reported that nutritional inadequacy represents a potential health threat to entire population. [7] According to American diabetes association reports overweight is a risk factor for developing this disease. [8] Epidemiological study of diabetes in different region of India declared the role of obesity in the pathogenesis of Type 2 Diabetes is complex and confounded by many heterogeneous factors.[9] The resent study conducted in North India. NFHS-3 data urban and rural area (all women aged 15-49) in 28 state of India and the national capital

Territory of Delhi during year 2005-2006 also showed a higher prevalence of overweight (BMI.25-29.9 kg/m^2) and obesity (BMI>30 Kg/m^2 among female in the states of India and ranked declared by NFHS on obesity, Punjab got 1st rank and Rajasthan is on 20th.[10]

A study by Hartemink et al. 36.27% of diabetes were overweight. There is a seven times greater risk of diabetes in obese people compared to those of healthy weight with a threefold increase in risk for overweight people.[11] The risk of DM increase with the degree and duration of being overweight or obese and a move central or visceral distribution of body fat, increased visceral fat enhance the degree of insulin resistance associated with obesity.[12] Beside the association of obesity. Our study also reveals the mean age of diabetes in various religions of Ajmer. Mean age of diabetes was found to be 53.9±9.7 in women of Ajmer, this is nearly equal to study done by Himanshu et al on the population of Ahmadabad, Gujarat and found mean age of IFG diabetes was the 56±12.8 and 44.6±14.4.[13] Shah A et al. reported 36.27 % diabetic female were overweight and Muslim show highest percentage of

overweight and least case was found among Naga (26,67) in the population of Manipur.[14].

Bandana Sachdev concluded that female were found to be at a marginally higher risk than male both in tribal and non tribal population of western Rajasthan [15] G Vijayakumar et al. reports prevalence of diabetes in Hindu Muslim and Christian was 11, 20.2 and 21.9 percentage respectively in rural central Kerala.[16] Our finding were in contrast to the findings reported by above studies, with respect to the incidence of diabetes in different religion of Ajmer. Muslim was one of the only religion that was less affected by obesity(r=0.23) as well as by age(r=0.07). Sikh were strongly affected with diabetes by both obesity (r=0.92) and age (r=0.70). Christians were highly affected by obesity(r=0.78) than age(r=0.31). Diabetes in Jain were highly correlated by obesity(r=0.86) but very less by age(r=0.19).Majority of the Jain member led a sedentary life and were non vegetarian with a high intake of oil and fat in there meal.

In this study we identified being overweight or obese as significant correlates for diabetes, among women of all religions because women continue to be old traditional ideal wives and mother and most of the time are home bound, busy cooking and looking after the house. Women do not have time for yoga or exercise or simple walk and continue to eat a good breakfast, lunch, dinner and snacks in between, thus leading to obesity and predisposing them to diabetes.

Although our finding highlight a most possible risk factor of diabetes type 2 and support the need to counsel all women about the negative effect of obesity and outcome complications of diabetes. These results are interpreted in light of the preliminary studies. This study was the first of its kind in our area to the best of our knowledge, as there is no reported data on incidence of diabetes in various religions of Ajmer.

7. Conclusion

Obesity is an important independent cause and risk factor for DMT2 in female of Ajmer. Advance age and obesity play a major role in the development of diabetes. Obesity more than 28 kg/m2 equally affect the women of all religion but in Sikh, Jain and Christian it is strongly correlated but in Hindu Sindhi and Muslim women were very weak associated with obesity. Onset of diabetes type2 was coinciding with the menopausal period of women. There have not been similar studies in the past in this region, through which comparisons could be made. Further studies should be required to justify the conclusion of risk of diabetes in religions of Ajmer Rajasthan (India).

8. Conflict of interests

No conflict of interest.

9. Acknowledgements

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