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HAZARD RATIO PREDICTION | DIABETES MELLITUS AND BMI RELATIONSHIP: STUDY IN A TERTIARY CARE HOSPITAL OF PAKISTAN

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ABSTRACT

Objective: This designed study established the outcomes of raised BMI on diabetes mellitus type 2 beginning and its associated complications among Pakistani urban community. **Methods:** This study was conducted in Mohtarma Benazir Bhutto Hospital Quetta. The data obtained from 250 individuals from March 2016 to September 2016. A cox proportional hazard model was used to judge the consequences of elevated BMI at the diagnosis of diabetes mellitus. Grouping was made to differentiate BMI categories for elevation of BMI and its effects on progress of diabetes. **Results:** Different hazard ratio pattern in risk was observed for various classes diabetes mellitus (HR=1.21 to HR=2.41), Insulin dependent (HR=1.67 to HR=3.47), non diabetics (HR=1.24 to HR=2.89), employed (HR=1.32 to HR=2.99), unemployed (HR=1.12 to HR=3.23), with education (HR=1.43 to HR=1.98), smoking (HR=1.59 to HR=2.66), alcoholics (HR=1.3 to HR=2.99), hypertension (HR=1.77 to HR=3.70), married (HR=0.99 to HR=2.88) and unmarried (HR=1.17 to HR=1.89). Increased risks of developing diabetes mellitus manifested in the BMI ≥40. Least risks to develop DM found in unmarried individuals. **Conclusions:** Amongst diagnosed diabetes mellitus persons, increased body mass index BMI were linked with consistently greater hazard of worse effects. Yet moderately raised BMI is linked with augmented hazards of developing diabetes mellitus. Greater hazards noted in hypertensive group and lower level risks observed in unmarried individuals.

KEYWORD: This designed study non diabetics unmarried individuals.

INTRODUCTION

Diabetes Mellitus Type 2 is a widespread occurring illness whose frequency is believed to be twice by the year 2030.[1] Mean lifetime menace of mounting diabetes mellitus type 2 for persons born in Pakistan before 2010 was 30.5 % for women and 25.9 % for men.[2] The figure of individuals having diabetes mellitus has augmented three folds from 8.7 % in the 1994-98 gallop study to 26.3 % in the 2016-17, comprising about 27.4 million people. There is a mounting tendency for younger individuals to have diabetes Mellitus as 30 % young people of age amid 20-39 years have type II diabetes Mellitus.[3] WHO revealed that till 2018, ratio of diabetes has been inclined in Pakistan with a rise in males 10 % and females 9.7 % averaging 9.8 %. Rise in the males been overweight with 19.1 % and females 22.7 %. Increase in male obesity 3.3% and females 6.4 %. Physically inactive males been raised with 18.5 % and females 29.7 %.[4]

At the same time, the prevalence of excess body weight has increased dramatically in Pakistan since last 30 years. As of 1990, 29 % adult Pakistani population was overweight (BMI 25< 30) or 31 % obese (BMI >30).[4] In adults above the age 60 years the occurrence of overweight was still higher. Adult obesity is anticipated to ascend by 33 % in coming two decades with excessive obesity incidence raising by 130 %.[5] Coalesce by the aging, these trends entail that there will be as numerous as 65 million further adult obese in 2030 than in 2010, of whom 24 million will be over the age of 60 years.[6] Numerous research studies have accounted a solid correlation among over weight and augmented menace of demise, inserting the overweight grouping at a 40% superior and the obese grouping at up to 300 % elevated threat of death than the persons whose BMI is normal (23 for normal BMI, 23 to 27.5 for overweight, 27.5 to 32.5 for obesity class-I, 32.5 to 37.5 for obesity class-II and with 37.5 or above BMI among obesity class-III population) for south east Asian population figures by WHO.[7,8] While overweight is a significant analyst of type 2 diabetes, the expression “Diabesity” was projected by Finer and Astrup in 2000.[9] Particularly, when compare women with usual BMI, overweight, obese class I and II (27.5 ≤ BMI < 32.5), and class III (BMI ≥ 37.5) persons have more hazards of rising type 2 diabetes mellitus with 7.6%, 20.1% and 38.8% higher threat respectively.[10] Those persons having diabetes mellitus are more than 17 times prone to take an amputation owing to a marginal vascular illness and associated to a

higher risk of producing retinopathy, nephropathy and coronary heart disease along with more adverse effects.[9] Furthermore, amid adults having age more than 60 years, the frequency of diabetes complications are escalating, apart from ocular complications.[11] i.e. now a days the peril of acute myocardial infarction for those having type two diabetes is as elevated as that stand for non-diabetics who have formerly suffered with acute myocardial infarction.[12] In current study, an alliance has been explored among overweight and that time when initially diagnosed type two diabetes mellitus. The hypothesis is that, over weight is not only linked to an augmented threat of type two diabetes mellitus instead it directs to a larger peril of a diversity of diabetes complications.

METHODOLOGY

This study has been conducted in Mohtarma Benazir Bhutto Hospital Quetta Pakistan during the year 2016. The data of 250 individuals with type 2 diabetes mellitus have been used. All persons have been interviewed with their consent. This study is managed in six months, March 2016 to September 2016 in episodes to attain flowing information on personal health issues, medical treatment and physical characteristics like, height and weight. The data information came through in patients and out patients with type two diabetes mellitus. Patient was asked about date of diagnosis and status of present BMI.

Patients in this study were born between 1954 and 1997. These were not on any diabetic medication and did not have diagnosed diabetes at the time of first base BMI. Data on age, BMI, year of birth, Height and weight were drawn from interview data. Imperfect information was plunged. After exclusion criteria the sample size was 250. This study recognized the time intermission of approximately six months from a person's initial interview to the first diabetes mellitus diagnosis. We estimated the Body mass index of individuals at the time of first baseline interview. We used an adjustment of adult overweight ($25 \leq BMI \leq 29.99$) and obesity ($BMI \geq 30$) criterion precised by the World Health Organization.[13] We sub grouped individuals into four BMI categories: i) BMI between 25 and 27.49; ii) BMI between 27.50 and 29.99; iii) BMI between 30 and 39.99; and iv) BMI greater than or equal to 40.[13]

Normal weight individuals ($18.5 \leq BMI < 25$) were use as the reference group. BMI was calculated as weight divided by the square of the height, firmed on the self explained weight and height measurements. More control variables incorporated, income, age, educational attainment (in years), race, hypertension, smoking status, and the year of the baseline interview. We estimate the outcome of BMI measured at baseline on time to first diagnosis of diabetes mellitus by calculating hazard ratio. Hazard ratio corresponds to how more likely individuals with raised body mass index are to grown DM above a short duration of time for individuals who have not so far developed diabetes mellitus. The hazard ratio, Cox hazard model may be explained as a partial comparative hazard above the whole study phase.

RESULTS

The individuals having diabetes mellitus, 75% are insulin dependent. The most 75% are diabetic employees while 60% are non diabetic employed individuals. Having grade 10 education remained 87.5% of diabetics while 50% of non diabetics were having education. 38.5% are diabetic smokers and 30% were non diabetic smokers. Only 6% were alcoholics and no alcoholics seen in non diabetic individuals. 28% were hypertensive while no hypertensive observed in non diabetics. Individuals having diabetic associated complications remained 8.5%. The married persons were 85% having diabetes while non diabetic married remained 30%. More than usual BMI was persistently correlated with an augmented panorama of being identified with type 2 diabetes mellitus (Table-2). Baseline variable of normal BMI less than 25 observed amongst overweight individuals at a larger hazard of diabetes mellitus. No obese or morbidly obese BMI individuals seen in non diabetics while this ratio was 25 and 17 in diabetic group. Slightly overweight persons noted in non diabetic group while this group remained too high in diabetic group (13 and 117 respectively in Table-2). Mean age with standard deviation of non diabetics were 35.9 years (11.4), for diabetics this was 43.8 years (10.1). Height and weight for non diabetics were 167.3 cm and 76.1 kg, for diabetics this ratio was 166.9 cm and 79.8 kg.

Table-3 manifests various baseline characteristics of BMI. Majority 36% of diabetic individuals having BMI of 30-39.99 (obese) while non diabetics having no BMI of this range. 36% of insulin dependents have the BMI of 30-39.99 (obese). Most of the employed diabetics, 33 (22%) having BMI of 25-27.49 overweight. Unemployed diabetic persons 44% of which having a BMI of 30-39.99 obese. The diabetics who have an education of grade 10 or more 36.5% were a BMI of 30-39.99 obese. The diabetic smokers 31.1% were having the BMI of 39.99 obese. 50% of alcoholic diabetic individuals have the BMI of 30-39.99 obese. The diabetics who were hypertensive 48.3% have BMI of 30-39.99 obese. The diabetic complications associated BMI of 30-39.99 obese which were marked seen in 43.7% of individuals. The married persons who have diabetes mellitus had the BMI of 29.1% shows 30-39.99 obese and unmarried diabetics had the BMI of 49.4% with 30-39.99 obese.

Elevated BMI was frequently linked with raised possibility of being diagnosed with type 2 diabetes mellitus (Table-4). Increased risk of being DM (HR=1.21) when individuals were slightly overweight (BMI 25-27.49), while this hazard becomes more and more (HR=1.47, 1.86) when BMI continuously increasing (BMI 27.5-29.9, 30-39.9) respectively. This ratio was (HR=2.41) almost 2.5 folds increased when individuals were morbidly obese (BMI=40>). Progressively raised BMI was highly attributed to

threefold increase in risk of developing diabetes mellitus amongst insulin dependent individuals (HR=1.67 to 3.47) respective to BMI (25-27.9 to >40). Non diabetics were also at the risk of developing DM when they have built an elevated BMI. When comparing employed to non employed diabetic persons it was manifested that unemployed were more high at risk if BMI >40 and HR=3.23. Maximum risk of DM almost four folds (HR=3.70) were noticed amongst individuals who had an associated hypertension (BMI=>40).

The extent of hazard ratios was constant to boost for all categories of increased BMI (Table-4).

Table -1.

Conditional List	Numbers	Percentile %
Diabetes Mellitus (n=200)	200	100
Insulin Dependent	150	75
Non diabetics (n=50)	050	25
Employed	150	75
Unemployed	050	25
Grade 10 education	175	87.5
Smoking	077	38.5
Alcoholics	012	06
Hypertension	056	28
Associated complications	017	8.5
Married	170	85
Unmarried	030	15

Table-2: Baseline Characteristics

	Group-A) Non diabetics	Group-B) Diabetics
Sample size	**50**	**200**
BMI<25	37	41
BMI 25-27.5	09	32
BMI 27.5-32.5	04	85
BMI 32.5-37.5	00	25
BMI >37.5	00	17
Age*	35.9(11.4)	43.8(10.1)
Height	167.3 (7.5)	166.9(6.8)
Weight	76.1(12.4)	79.8(14.2)

*Mean with standard deviation ( )

Table -3: Various Baseline Characteristics by Body Mass Index.

	Body Mass Index			
	25-27.49	**27.5-29.99**	**30-39.99**	**> 40**
Diabetes Mellitus (n=200)	41 (20.5%)	39 (19.5%)	72 (36%)	03 (1.5%)
Insulin Dependent (n=150)	29 (19.3%)	34 (22.6%)	54 (36%)	02 (1.3%)
Non diabetics (n=50)	10 (20%)	05 (10%)	00	00
Employed (n=150)	33 (22%)	27(18%)	32 (21.3%)	00
Unemployed (n=50)	10 (20%)	10 (20%)	22 (44%)	00
Grade 10 education (n=175)	36 (21.1%)	35 (20%)	64 (36.5%)	03(1.7%)
Smoking (n=77)	16 (20.7%)	18 (23.3%)	24 (31.1%)	00
Alcoholics (n=08)	02 (25%)	01 (12.5%)	04 (50%)	01(12.5%)
Hypertension (n=60)	13 (21.6%)	12 (20%)	29 (48.3%)	01(1.6%)
Associated complications (n=80)	14 (17.5%)	15 (18.7%)	35 (43.7%)	03(3.7%)
Married (n=103)	21 (20.3%)	21 (20.3%)	30 (29.1%)	00
Unmarried (n=97)	16 (16.4%)	16 (16.4%)	48 (49.4%)	04 (4.1%)

BMI explanations: 18-24.99=Normal, 25-27.49=Slight overweight, 27.5-29.99=Overweight, 30-39.99=Obese, 40> Morbidly Obese.

Table 4: Hazard Ratios of Diabetes Mellitus Associated Characteristic by Body Mass Index.

	Body Mass Index			
	25-27.49	**27.5-29.99**	**30-39.99**	**> 40**
Diabetes Mellitus (n=200)	**1.21**	**1.47**	**1.86**	**2.41**
	(1.27-1.48)	(1.51-1.80)	(1.78-2.21)	(2.11-3.88)
	[0.00]	[0.00]	[0.01]	[0.00]
Insulin Dependent (n=150)	**1.67**	**1.87**	**2.55**	**3.47**
	(0.95-1.60)	(1.16-2.01)	(1.50-2.56)	(2.77-3.21)
	[0.00]	[0.20]	[0.00]	[0.00]
Non diabetics (n=50)	**1.24**	**1.34**	**2.01**	**2.89**
	(1.00-1.32)	(1.07-1.88)	(1.88-2.67)	(2.05-4.22)
	[0.00]	[0.77]	[0.00]	[0.00]
Employed (n=150)	**1.32**	**1.26**	**2.12**	**2.99**
	(1.07-1.66)	(1.17-1.90)	(0.87-2.01)	(1.89-5.09)
	[0.05]	[0.88]	[0.00]	[0.00]
Unemployed (n=50)	**1.12**	**1.87**	**2.99**	**3.23**
	(1.32-2.11)	(1.22-1.87)	(2.06-3.00)	(2.21-4.01)
	[0.00]	[0.01]	[0.00]	[0.00]
Grade 10 education (n=175)	**1.43**	**1.88**	**2.11**	**1.98**
	(0.91-1.76)	(0.89-1.99)	(1.79-2.41)	(1.44-3.66)
	[0.21]	[0.07]	[0.00]	[0.99]
Smoking (n=77)	**1.59**	**2.17**	**1.38**	**2.66**
	(0.87-1.23)	(0.91-1.88)	(0.70-2.82)	(2.87-3.77)
	[0.15]	[0.12]	[0.00]	[0.04]
Alcoholics (n=08)	**1.13**	**2.01**	**1.93**	**2.99**
	(1.82-1.99)	(1.17-1.89)	(2.08-2.87)	(2.76-4.01)
Hypertension (n=60)	[0.00]	[0.17]	[0.00]	[0.00]
Associated complications (n=80)	**1.77**	**1.97**	**2.77**	**3.70**
	(0.84-1.22)	(0.71-1.89)	(2.09-3.91)	(2.33-4.22)
	[0.00]	[0.33]	[0.00]	[0.01]
Married (n=103)	**0.99**	**1.37**	**2.01**	**2.88**
	(0.27-1.37)	(0.88-1.69)	(1.77-2.98)	(2.01-3.81)
	[0.17]	[0.00]	[0.71]	[0.00]
Unmarried (n=97)	**1.17**	**1.07**	**1.38**	**1.89**
	(0.74-1.11)	(0.89-1.73)	(0.83-2.01)	(2.07-3.83)
	[0.00]	[0.14]	[0.00]	[0.13]

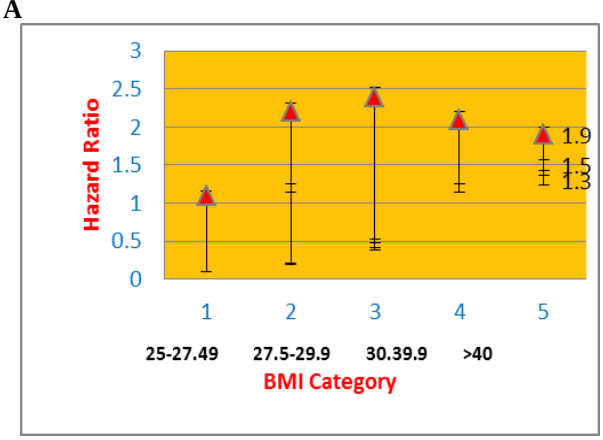
Note: The approximates of hazard Ratio are established on Cox- proportional hazard model which is controlling for Insulin dependency, employment, education, smoking, alcoholic, hypertension, complications, marital status and non diabetics.

Statistically significant coefficients are in parenthesis, 95% confidence intervals are in bold, p-values present in square brackets.

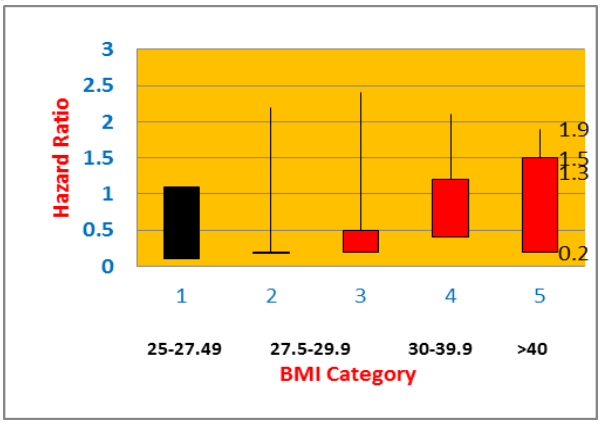
The cut off value of BMI estimated 18-24.9 as normal.

Hazard Ratio of Type 2 Diabetes Mellitus

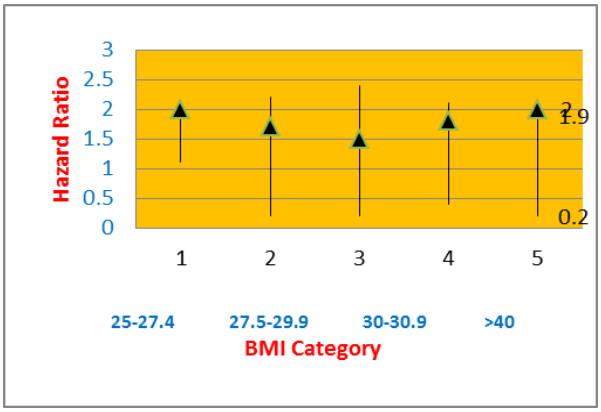
A



B



C



A) Insulin Dependency
B) Non Diabetics
C) Diabetic Complications

DISCUSSION

This comprehensive study inspects the outcome of BMI level on instance to finding of diabetes mellitus type 2 among persons upto age 43 years. There was an excess over weight and obesity found during BMI assessment which remained a key causative aspect to develop type 2 diabetes mellitus. Looking at the overweight class (25-29.9 BMI) were at raised danger of mounting diabetes mellitus with 19.5% and 22.6% larger risks orderly. With the BMI of 30-39.9 unemployed are 100% at the risk hazard of diabetes mellitus comparing with equivalent employed individuals. At the BMI $\geq$ 40 enhances the probability of rising diabetes mellitus by as much as three folds or above in certain groups like, insulin dependent individuals, unemployed and hypertensive diabetics. These outcomes propose a solid connection among Body Mass Index and commencement of diabetes mellitus than was formerly renowned in analogous study.[14] For deterrence of associated complications of diabetes mellitus, maintaining a good weight might be more significant at lesser levels of overweight (25-27.9 BMI). The mount in hazard of developing diabetes mellitus associated complications does not start until otherwise BMI exceeds 27.5. Persons in the group of obese BMI (BMI $\geq$ 30 above) were constantly at larger menace of developing diabetic associated complications as much as four folds for all complication forms irrespective of any group demarcation. Beside obese are at larger peril of rising hypertension in contrast to those diabetics with other various categories of BMI.

Following outcome entails that weight loss is a significant deterrent approach for pre-diabetes overweight, which may bring about a holdup during development of diabetes mellitus. Numerous on hand weight reduction plans, with nutritional, physical bustle and behavioral intrusions are thriving in durable weight management and direct to a considerable reduction in diabetes prevalence.[15-17] These plans might establish to be lucrative in the long run for control of diabetes mellitus type 2 and related snags in older persons.[18-19]

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