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Parity and Breastfeeding in Relation to Maternal Risk of Type-II Diabetes

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Abstract
There is an association of high parity and breastfeeding with occurrence of diabetes as found that parous women are at greater risk of diabetic mortality than nulliparous women. The aimed of the study was to determine the relationship between parity, breastfeeding and type-II diabetes among women of Khyber Pakhtunkhwa, Pakistan. A hospital based case-control study was carried out from Oct, 2015 to Feb, 2016 at Rehman Medical Institute Hayatabad, Peshawar. Simple random sampling technique was used to select 200 subjects (100 cases and 100 controls). Women were interviewed for socio-demographic variables, anthropometric measurements, biochemical, health, breastfeeding and parity through pre-tested standard questionnaire. Standard chi-square test was applied on categorical data to establish an association between the variables at 5% level of significance and Odds ratio was applied to find out the relationship between risk factors and diabetes. Findings illustrated significant difference between husband education, family size, monthly income and socioeconomic condition of both groups ($p< 0.05$). Family size of cases was significantly higher in case group. Significant results were found for para, gravida ($p=0.000$) and gestational diabetes in earlier pregnancy ($p=0.001$). The breastfeeding history supported that low ratio of doing breastfeeding and exclusive breastfeeding may associate with diabetes. Significant results were obtained for less breastfeeding and physical activity in relation to diabetes ($p< 0.000$). Overweight and obesity (66%) was recorded to indicate the poor nutritional status of the subjects. It was concluded that parity, gravida and short duration of breastfeeding and lower physical activity showed a strong association with higher risk of maternal diabetes mellitus ($p< 0.05$).
Keywords: Breastfeeding, Gravida, Parity, Gestational diabetes

1. Introduction

Diabetes mellitus is a metabolic syndrome that is characterized by prolonged high concentration of blood glucose that results in poor metabolism of carbohydrate, protein and fats that results from flaws in the secretion of insulin [1]. Globally, incidence of type-II diabetes mellitus has been expected to increase from 150 to 300 million by 2025 [2] with half of all diabetes cases occurring in low to middle income countries. About 60% of all the diabetic patients who suffer a lot are from South Asian countries [3]. At global level, countries in which people suffer a lot from diabetes, Pakistan stand at 6th position [4]. It was reported that in KPK diabetes prevalence is 11.6 % in adult females [5].

Main risk factors of type-II diabetes are physical inactivity and obesity and both of them can be prevented [6]. Greater number of children is assumed to be risk of type-II diabetes [7], while some studies suggested that high parity is not associated with type-II diabetes [8]. Significant positive association was found between number of pregnancies and fasting insulin concentrations [9]. Low socioeconomic status, Income and education contribute in establishing a relationship between multiparity and diabetes [10]. Some previous studies stated that parity mostly five or more births may have an association with greater chances of diabetes [11].

There is an association of parity and breastfeeding with occurrence of diabetes as found that parous women are at greater risk to die of diabetes than nulliparous women. Those women having greater number of children have a high energy intake and sedentary lifestyle than women who have less number of children. Higher BMI is shown due to sedentary life style behaviors that result into the occurrence of diabetes [12]. Higher parity may be the reason for development of obesity which results into the occurrence of diabetes [13]. Those who breastfeed for a continuous six month period have less chances of developing type-II diabetes than those who do not breastfeed [14]. Longer the duration of breastfeeding lesser will the risk of developing type-II diabetes. In women lactation reduces the risk of diabetes by improving glucose homeostasis. If the duration of breastfeeding is increased then there will be less chance of disease. The risk of developing type-II diabetes lowers by almost a third in women having two numbers of children and breastfeeding each child for a year. Having breastfed within the past 15 years is found to be strongly protective against the disease after controlling for all the risk factors associated with type-II diabetes [15].

Type-II diabetes is mainly focused as it is highly prevalent, but there is a strong association of parity and breastfeeding with type-II diabetes but never been focused before. Very few studies have been conducted on parity and breastfeeding associated with diabetes in women in past era so present study was intended to determine the relationship between parity, breastfeeding and type-II diabetes in Peshawar.

2. MATERIAL AND METHODS

2.1. Study design and location

A case-control study was conducted at Rehman Medical Institute Hayatabad, Peshawar- Pakistan.

2.2. Sample size and selection criteria

A total of 200 subjects were selected (100 cases and 100 controls). Inclusion criteria for cases was diabetic women with family history of diabetes, all non-pregnant with age ≥40 years i.e. either fasting blood glucose level ≥ 126 mg/dl or random blood sugar levels of ≥ 200 mg/dl, and free from all other illness. An inclusion criteria for controls was the women of the same age who accompanied diabetic patients in the hospital i.e. either fasting blood glucose level <126 mg/dl or random blood sugar level of <200 mg/dl and free from all transferable and persistent diseases [1].

2.3. Study protocol

For conducting this case control study an approval was acquired from the Chief Executive of the Rehman Medical Institute, Peshawar. For the enrollment of subjects outpatient department of medical wards were used as a platform. Women present at the wards were interviewed about health, family history and parity and their responses were recorded in a questionnaire. The subjects fulfilling the inclusion criteria were enrolled for the study and informed consent was attained earlier to their enrollment.

2.4. Demographic and socio-economic characteristics

Socio-demographic variables were determined by interviewing the subjects about their age, family type, education, socio-economic condition, profession, family monthly income and their responses were recorded in the questionnaire.

2.5. Medical history and health status

Health status was measured by asking questions about family history of diabetes, gestational diabetes, parity and gravida. They were asked about breastfeeding history and its duration. Knowledge concerning abortion, miscarriages and still births was not gathered as the term parity indicates live full term births of one or more infants.

2.6. Anthropometric measurements

Weight, height, waist and hip circumferences of all the subjects were measured by WHO recommended procedure. Subjects were categorized into underweight, normal, overweight and obese by using WHO classification [16]. Body mass index (BMI) was calculated from weight/height measurements.

2.7. Biochemical assessment

A glucometer was used for determining the approximate concentration of blood glucose. A drop of blood was put on a disposable test strip of glucometer and the readings were recorded in mg/dl.

2.8. Data entry and statistical analysis

All the data was entered into the statistical package for social sciences (SPSS) for inspecting error and statistical analysis. Descriptive statistics counting mean, median, frequency, and standard deviation was found out and data was inspected to apply fitting statistics. T-test and standard chi-square test was used to find out the mean difference between the cases and controls at 5% level of significance. Odds ratio was applied to estimate the relationship between parity and breastfeeding in relation to type-II diabetes.

3. RESULTS

3.1. Socio demographic characteristics of the subjects (n=200)

The average age of control and cases was 55.61±7.684 and 60.96±10.527 years respectively. No significant difference was found between family type, house, subject education, husband and subject occupation between the two groups while there was a significant difference between family size, husband education, family monthly income and socioeconomic condition of the two groups. Family size of cases was significantly higher than control group.

Table- 1: Socio demographic characteristics of the subjects (n=200)

Variable		Mean ± SD/Frequency (%) Controls	Cases	P-value
Age (years)		55.61±7.684	60.96±10.527	0.000*
Family type	Joint	45(45)	43(43)	0.776
	Nuclear	55(55)	57(57)	
Family size	<5	18(18)	5(5)	0.004*
	≥5	82(82)	95(95)	
House	Own	90(90)	86(86)	0.321
	Rented	10(10)	12(12)	
Husband education	Illiterate	40(40)	25(25)	0.032
	<intermediate	22(22)	36(36)	
	≥intermediate	38(38)	39(39)	
Husband occupation	Government	41(41)	30(30)	0.055
	Private	59(59)	60(60)	
Subject education	Illiterate	43(43)	46(46)	0.911
	<intermediate	32(32)	30(30)	
	≥intermediate	25(25)	24(24)	
Subject occupation	Government	6(6)	7(7)	0.714
	Private	8(8)	8(8)	
	House wife	86(86)	86(86)	
Family monthly income (Rupees)	<12000	6(6)	3(3)	0.043*
	12000-25000	15(15)	29(29)	
	≥25000	79(79)	68(68)	
Socioeconomic condition	Satisfactory	83(83)	64(64)	0.002*
	Unsatisfactory	17(17)	36(36)	

*= significant at p <0.05, %= percent, p= probability, SD = standard deviation

3.2. Medical and health history of the subjects (n=200)

There was non-significant difference for family history of diabetes between cases and controls (p> 0.05). Significant results were found for para, gravida (p< 0.001) and gestational diabetes in earlier pregnancy (p < 0.01). In control and case group, 63% and 51% breastfed their every child respectively. Among controls 78% started breastfeeding to child within 1 hour, 13% within 24 hours, and 9% after 2 or more days of delivery. Majority of the cases (84%) started breastfeeding the child within 1 hour after delivery. In control and case 60% and 22% of women exclusively breastfeeding to children for 6 months. The breastfeeding history supported that low ratio of doing breastfeeding and exclusive breastfeeding may be associated with diabetes. Significant results were obtained for breastfeeding in relation to diabetes (p < 0.001).

Table- 2: Medical and health history of the subjects (n=200)

Variables		Frequency (%)		P value
		Control	Case	
Chronic condition	Diabetes type 2	0	99	0.774
	High cholesterol	10	1	
	High blood pressure	14	0	
	Heart disease	6	0	
Blood glucose	Fasting	101.56	189.80	0.000*
	Random	131.45	250.04	
No. of para	< 5	74	33	0.000*
	≥ 5	26	67	
No. of gravida	<5	67	13	0.000*
	≥5	33	87	
Gestational diabetes occurred in any earlier pregnancy	Yes	4	18	0.001*
	No	96	82	
Did you breastfeed your every child	Yes	63	51	0.058
	No	37	49	
How long after delivery breastfeeding was started	Within 1 hour	78	84	0.2
	Within 24 hour	13	13	
	After 2 or more days	9	3	
For how much time child breastfed exclusively	<4 months	3	15	0.000*
	4-6 months	19	42	
	6 months	60	22	
	≥ 6 months	18	18	
Starting age of weaning	< 4 months	2	13	0.007
	4-6 months	26	32	
	6 months	72	54	
	≥ 6 months	0	1	
Complementary feeding continued	6-12 years	4	30	0.000*
	Up to 2 years	96	70	
Birth control pills	Yes	17	37	0.001*
	No	83	63	
For how much time	≤ 5	10	26	0.102
	>5 or ≤ 10 years	7	13	
	>10 years	2	0	
Menopausal status	Yes	92	82	0.036*
	No	8	18	
After every delivery reduced weight	Yes	79	41	0.000*
	No	21	59	
Exercise	Yes	37	22	0.020*
	No	63	78	
Activity at home	Walk	37	22	0.001*
	Cleaning home	2	8	
	Laundry	0	3	
	Cooking food	56	48	
	Caring for handicapped people	0	7	
	All of the above	24	29	
	None	18	5	
Duration of physical activity	1 hour/week	0	7	0.000*
	2 hours/week	1	16	
	Once in a week	1	9	
	Twice in a week	7	7	
	None	62	59	
	Daily	29	2	
Age at first birth	<20	55	53	0.33
	20-30	43	47	
	>30	2	O	
Age at last birth	20-30	56	15	0.000*
	>30	44	85	
Stress	Yes	41	74	0.000*
	No	59	26	
Headache	Yes	63	67	0.328
	No	37	33	
Age at first pregnancy	<20	73	72	0.337
	20-30	25	28	
	>30	2	0	
Kind of diabetes treatment	Diet	0	38	0.000*
	Insulin	0	11	
	Oral hypoglycemic agents	0	39	
	None	100	12	

No. Number, *= Significant at p< 0.001, %= Percent, P= probability

3.3. Anthropometric assessment of the subjects (n=200)

Table 4 shows the weight, height, BMI, waist and hip circumference of both the case and control group. Mean weight, height, BMI, WC, HP and WHR of the control group was 59.84 kg, 154.48, 25.076, 94.74, 100.59 and 0.9396 while for the case group 65.08, 155.65, 26.863, 102.13, 106.20 and 0.9426 respectively. There was non-significant difference among the anthropometric measurements of both the groups except weight.

Table- 3: Anthropometric assessment of the subjects (n=200)

Variable	Mean		p-value
	Control	Case	
Weight (kg)	59.84	65.08	0.000*
Height (cm)	154.48	155.65	0.087
BMI	25.076	26.863	0.308
Waist circumference(cm)	94.74	102.13	0.060
Hip circumference(cm)	100.59	106.20	0.126
Waist to hip ratio	0.9396	0.9426	0.135

BMI= Body Mass Index, P= probability, Kg= Kilogram, Cm= centimeter

3.4. Nutritional status of the subjects on the basis of BMI (n=200)

In control group the percentages of underweight, normal weight and overweight/ obese subjects were 2%, 57% and 41% respectively while in case group were 0%, 34% and 66% respectively. It indicated that overweight and obesity is also main risk factors lead to maternal diabetes.

Table- 4: Nutritional status of the subjects on the basis of BMI (n=200)

Variable		Frequency (%)		P- value
		Controls	Cases	
BMI categories	Under weight	2	0	0.001*
	Normal weight	57	34	
	Overweight & obese	41	66	

BMI= Body mass index.

3.5. Risk estimation for health characteristics of the subjects

Women who were living in joint family system were 0.922 (0.527-1.612) times less exposed to the disease as compared to those who live in nuclear family type. Those women who had family size less than 5 are 0.240 (0.085-0.674) times less exposed to the disease as compared to those who had family size greater or equal to 5. Women having satisfactory socio economic condition were 0.364 (0.188-0.706) times less exposed to the disease. Women having history of diabetes are 1.056 (0.522-2.019) times more exposed to diabetes. Those women who had less than 5 numbers of children are 0.150 (0.036-0.151) times less exposed to the disease as compared to those who had greater than 5 numbers of children. Women who had less than 5 numbers of pregnancies were 0.074 (0.036-0.151) times less exposed to the disease. Women having gestational diabetes are 5.268 (1.714-16.192) times more exposed to disease. Women who had reached their menopausal status are 0.396 (0.164-0.959) times less exposed to the disease. Women who weaned their children for 6-12 months were 10.268 (3.466-30.525) times more exposed to disease. Women who used birth control pills were 2.867 (1.480-5.554) times more exposed to diabetes. Women who had reduced their weight after every delivery are 0.185 (0.099-0.345) times less exposed to the disease. Women who were doing exercise were 0.480 (0.257-0.896) times less exposed to the disease. Those women who took stress were 4.096(2.251-7.453) times more exposed to disease.

Table- 5: Risk estimation for health characteristics of the subjects

Variable	Categories	Groups		OR	P-Value
		Case	Control		
Family type	Joint	43	57	0.922 (0.527-1.612)	0.776
	Nuclear	57	55		
Family size	< 5	5	18	0.240 (0.085-0.674)	0.004*
	>Or equal to 5	95	82		
Socioeconomic status	Satisfactory	64	83	0.364 (0.188-0.706)	0.004*
	Unsatisfactory	36	17		
Family history of diabetes	Yes	43	25	1.056 (0.552-2.019)	0.869
	No	57	35		
No. of para	< 5	33	67	0.150 (0.072-0311)	0.000*
	>or equal to 5	46	14		
No. of gravida	< 5	13	67	0.074 (0.036-0.151)	0.000*
	>or equal to 5	87	33		
Gestational diabetes	Yes	18	4	5.268 (1.714-16.192)	0.002*
	No	82	96		
Birth control pills	Yes	37	17	2.867 (1.480- 5.554)	0.001*
	No	63	83		
Menopausal status	Yes	82	92	0.396 (0.164-0.959)	0.036*
	No	18	8		
Weight reduction after delivery	Yes	41	79	0.185 (0.099-0.345	0.000*
	No	59	21		
Exercise	Yes	22	37	0.480 (0.257-0.896)	0.020*
	No	78	63		
Stress/ tension	Yes	74	41	4.096 (2.251- 7.453)	0.000*
	No	26	59		

OR= odds ratio, CI= confidence interval, No= number, P= probability, *= significant at p < 0.001.

4. Discussion

Mean age of diabetics was higher than controls as reported by Midhet *et al*. (2010) that cases have higher age as compared to controls (p= 0.000) [17]. Majority of the cases had poor socioeconomic condition and low monthly income. This result is similar to the study conducted by Rabi *et al*. (2006) that low income and poor socioeconomic condition is related with greater prevalence of type 2 diabetes (p < 0.005) [18]. The findings of our study indicate that high family size, lower education, poor socioeconomic status and low income may be the risk factors associated with maternal type-II diabetes.

The study findings suggested that high parity is a risk factor of maternal type-II diabetes as reported by Nicholson *et al*. (2006) in Caucasian and African-American women that higher parity leads to diabetes (p <0.001) [7]. The result is also parallel with the study conducted by Cure *et al*. (2015) that multiparous women had increased risk of diabetes [19]. Nicholson *et al.* (2006) also found that women with gestational diabetes in earlier age were at more risk to have diabetes [7]. Results on breastfeeding and duration of breastfeeding (p> 0.05) showed non-significant association between cases and controls. This result is in line with study conducted by Jager *et al*. (2014) that there is an inverse association between duration of breastfeeding and risk of diabetes [20]. The study results suggested that low physical activity is the risk factor for type 2 diabetes. Majority of the women among case group performed physical activity as compared to controls and significant results were obtained (p< 0.000). This result is paralleled with the study conducted by Nicholson *et al*. (2006) that women with multiparity had lower physical activity level [7]. Majority of the women from case group were suffering from stress as compared to control group and significant results were obtained. This result is similar to the study conducted by Surwit *et al.* (2002) who found that stress plays a role in the onset of diabetes [21]. Stress affects blood glucose levels. The release of stress hormones such as adrenaline can cause a buildup of glucose in blood stream of diabetic people.

Overweight and obesity were more prevalent in case group assessed by BMI level of the subjects and the result is almost similar to the study conducted by Ford *et al.* (1980) who found that increase in BMI in United States that occurred during the 1980s may indicate an increase in the frequency of type-II diabetes and their study showed that reduced weight was related with a low risk of diabetes [22].

Cure *et al*. (2015) found that the odds ratio for the relationship of history of diabetes with type 2 diabetes was 4.6 (3.0-7.0) and he also reported that the odds ratio for the association of parity i.e. number of children greater than 5 with type 2 diabetes was 5.3 (1.2-23.5) while the odds ratio for the association between

total number of pregnancies and type-II diabetes was 1.11 (1.06-1.16) 95% confidence intervals [23]. Dye *et al.* (1997) found that the odds ratio for the association of gestational diabetes and type 2 diabetes was 1.9 95% confidence interval (1.2-3.1) [24]. Zhang *et al*. (2005) reported that value of odds ratio for the relation of socioeconomic condition with type 2 diabetes was 4.56 (3.20-6.48) and found that lower income was associated with increased odds of type 2 diabetes in china [25].

5. Conclusion and Recommendation

Parity, gravida and shorter duration of breastfeeding showed a significant association with increased risk of type 2 diabetes mellitus. Lower physical activity and diet rich in junk and other fatty foods significantly increases the risk of type 2 diabetes. Family sizes, lower socio-economic level, husband's education, stress and weight also has a significant effect on type 2 diabetes development.

The findings suggest that there is a need to educate people about risks related to higher parity and short duration of breastfeeding. All the persons who have greater than 40 years of age and history of diabetes are recommended to check their blood sugar level. All the diabetic women should exercise daily for almost 30 minutes. Emphasis should be given on the consumption of fruits and vegetables.

Conflict of Interests

The author(s) declare that they have no competing interest.

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