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Research Article

**TO DETERMINE PREVALENCE OF DIABETES MELLITUS  
AND HYPERTENSION AS A COMORBIDITY AMONG  
WOMEN OF YOUNG REPRODUCTIVE AGE: A CROSS-  
SECTIONAL ANALYSIS**Dr Muhammad Usman Zia<sup>1</sup>, Dr Zara Afzal<sup>1</sup>, Dr Syeda Khadija Amjad<sup>2</sup><sup>1</sup> Multan Medical and Dental College, Multan<sup>2</sup> Mayo Hospital, Lahore

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**Abstract:**

**Objectives:** To assess the prevalence of diabetes and hypertension as a comorbidity among young women of reproductive age.

**Methodology:** A prospective observational study was conducted at Nishtar Hospital, Multan from April 2018 to June 2019, on women of ages between 18 to 45 years who presented to the outpatients department for regular check-ups or follow-ups were included in the study. All patients who refused to take part, or were older than 45 years of age were excluded from the study. Data on demographic variables and presence of hypertension and/or diabetes was recorded. All data was processed via SPSS v. 25. A p-value of <0.05 was considered significant.

**Results:** A total of 444 female population of reproductive age enrolled in the present study with a mean age of 31.6 ± 12.3 years. In the present study, a body mass index (BMI) of 29.3 ± 5.2 kg/m<sup>2</sup> was observed. 70 (15.6%) participants in our study smoked daily, while 374 (84.4%) never smoked. We estimated that 9 (2.0%) women in our study had hypertension and diabetes as comorbidity. About 229 women were normotensive and normoglycemic, while 55 women with normal blood pressure were prediabetic while 41 women with prediabetes were prehypertensive as well.

**Conclusion:** The increasing prevalence of comorbid conditions during women's reproductive age is a threat to healthy neonatal and maternal outcome. Therefore, serious primary care intervention is needed to reduce prevalence and to improve awareness, detection and management of hypertension and diabetes as comorbid conditions.

**Keywords:** diabetes mellitus, DM type II, hypertension, comorbidity, mortality, reproductive health

**Corresponding author:**

Dr. Muhammad Usman Zia,  
Multan Medical and Dental College, Multan

QR code



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**INTRODUCTION:**

The National Institute for Health and Care Excellence (NICE) has defined hypertension as the most important preventable cause of premature morbidity and mortality, worldwide. <sup>1</sup> It is responsible for at least one-third deaths, globally and a similar percentage of mortality in Pakistan as well. Despite recent improvement in the provision of quality of healthcare, both hypertension and diabetes mellitus remain the leading cause of death in our country. <sup>2, 3</sup> Hypertension and diabetes, both pose serious threat to young adults, all over the world. It is estimated that the burden of hypertension will increase by 60% to reach a population of 1.5 by the year 2025. <sup>4</sup>

Essential hypertension in mothers giving birth is associated with an increased risk of preterm delivery, intrauterine growth retardation, perinatal mortality. <sup>5</sup> Similarly, it is well established that neonatal outcome is worse with increased perinatal mortality in infants born to diabetic mothers. They are also at a higher risk of giving birth to babies who have congenital abnormalities, and greater risk of developing preeclampsia and other associated adverse obstetrical outcomes. <sup>6, 7</sup>

The onset of hypertension and diabetes are almost always asymptomatic and their onset is insidious and often both diagnosed during regular check-ups. Most cases of hypertension are primary, i.e. with no other medical cause. Most women with hypertension and diabetes as comorbidity are at greater risks of birth-related complications. In a study by Yankit KE. *et al*, it was reported that hypertension and diabetes as comorbidity caused increased number of stillbirths, abortions, miscarriages, preterm birth, preeclampsia, intrauterine growth retardation, and complicated delivery rates as compared to patients with either hypertension or diabetes alone. <sup>8</sup>

Although recent evidence indicates that hypertension and diabetes type 2 as comorbidity are associated with negative obstetrical outcomes for both the mother and the fetus, nevertheless, the literature has been inconsistent. The data on hypertension and diabetes as a coexisting condition among young women of reproductive age is deficient. Specifically, data on the prevalence of hypertension and diabetes as concomitant conditions in the Irish young women population is lacking. Hence, the present study was designed to evaluate the prevalence of hypertension and diabetes mellitus type 2 as a comorbidity among the young adult women population in order to develop new strategies to tackle this emerging health catastrophe.

**METHODOLOGY:**

A cross-sectional, prospective study was conducted at Nishtar Hospital, Multan between April 2018 to

June 2019. Ethical approval was obtained from the IRB ethical committee and informed written consent was obtained from all patients prior to the study. A sample size of 168 was obtained using select statistics, keeping a prevalence of hypertension as 12.5% according to The Chronic Conditions Hub. <sup>9</sup> A non-probability, universal sampling technique was used to enroll patients in the study. Female patients between the age of 18 and 45 years, who visited the outpatients department of Liaquat University Hospital, Jamshoro, Hyderabad were enrolled in the study. All female patients over the age of 45 years, and male patients were excluded from the study.

A detailed demographics information was recorded from patients through a predefined pro forma and a standardized questionnaire. Variables of interest included, age, marital status, educational status, employment, number of birth both alive or otherwise, body mass index (BMI), any significant family history of either hypertension or diabetes mellitus and medical or surgical history.

Our main outcome variables were hypertension and diabetes as comorbidity among women of reproductive age. We labelled participants as diabetic if they i) self-reported diagnosis, or ii) had their glycosylated hemoglobin (HbA1C) of equal or more than 6.5%. HbA1C was measured using capillary whole blood collected from a finger prick, which has been considered as a valid and reliable test for the diagnosis of diabetes mellitus type 2. <sup>10, 11</sup>

Based on the ADA criteria, women with A1C  $\geq$  6.5% or a diagnosis were categorized as having diabetes, and women with A1C between 5.7–6.5% without a diagnosis were categorized as having prediabetes. Finally, women with an A1C  $<$  5.7% without a diagnosis were categorized as having normoglycemia (neither prediabetes or diabetes). Sitting and standing clinic BP and heart rate were measured from the right arm, with the use of a regularly calibrated validated automated sphygmomanometer (Omron HEM-705CP),<sup>12</sup> in accordance with the recommendations of the British Hypertension Society. <sup>12</sup>

Women were categorized as being hypertensive if they had systolic blood pressure (SBP) of 140 or above, diastolic blood pressure (DBP) of 90 or above, or self-reported a diagnosis.

Blood pressure was taken according to standard protocols. Participants were categorized as prehypertensive if they had systolic blood pressure between 120 to 139 or diastolic blood pressure of 80 to 89 mmHg without a prior definite diagnosis by a specialist. <sup>13</sup>

Women were categorized as normotensive if their SBP was less than 120 and DBP was less than 80. Women were categorized with hypertension and diabetes as comorbidity if, by the above-mentioned criteria, they were found to have both conditions.

#### Statistical Analysis

Statistical Package for social sciences (SPSS v. 25) was used to conduct analysis on the recorded data. Mean  $\pm$  standard deviation was used to represent quantitative variables. Categorical data was

represented by frequencies and percentages. Data was represented in tabular forms.

#### RESULTS:

A total of 444 female population of reproductive age enrolled in the present study with a mean age of 31.6  $\pm$  12.3 years. Demographic details are represented in table 1. In the present study, a body mass index of 29.3  $\pm$  5.2 kg/m<sup>2</sup> was observed. 70 (15.6%) participants in our study smoked daily, while 374 (84.4%) had no history of smoking.

**Table 1. Demographic profile of participants in the study (n=444)**

Variable	N (%)
<b>Age groups</b>	
18-30	129 (29.0%)
31-45	315 (70.9%)
<b>Marital Status</b>	
Married	226 (50.9%)
Unmarried	132 (29.7%)
Separated/Divorced	46 (10.3%)
<b>Number of Births</b>	
None	256 (57.6%)
<2	157 (35.3%)
>2	31 (6.9%)
<b>Employment status</b>	
Self-Employed	53 (11.9%)
Formal employment	305 (68.6%)
Unemployed	19 (4.2%)
<b>History of Smoking</b>	
Current smoker	70 (15.6%)
No history of smoking	374 (84.4%)

Table 2 demonstrates the relationship between hypertension and diabetes among participants. We estimated that 9 (2.0%) women in our study had hypertension and diabetes as comorbidity. About 229 women were normotensive and normoglycemic, while 55 women with normal blood pressure were prediabetic while 41 women with prediabetes were prehypertensive as well.

**Table 2. Distribution of hypertension and diabetes among women in our study n=444**

	Normoglycemic (318)	Prediabetic (110)	Diabetic (16)
Normotensive (288)	229	55	4
Prehypertensive (127)	73	41	3
Hypertensive (29)	16	14	9

**DISCUSSION:**

There is a well established link between hypertension and diabetes mellitus. The association between these two diseases have been a topic of research for decades. A recent study by Iglay K. et al, used the Quintiles Electronic Medical Record database with the aim to determine the prevalence of and co-prevalence of common comorbidities in type 2 diabetic mellitus patients. The report concluded that hypertension is the most common comorbidity found in patients already diagnosed with diabetes type 2. It was also revealed that the combination of hypertension and hyperlipidemia, followed by hypertension and obesity had the highest co-prevalence among these patients. This highlights the importance of early detection and prevention of diabetes as well as hypertension among people who are at higher risk of developing these conditions.<sup>14</sup> Emerging evidence has shown that the incidence of these diseases were once greater in elderly, but now, both hypertension and diabetes are increasingly prevalent in the younger generation as well. Both hypertension and diabetes increase the risks of adverse obstetrical outcomes for women of reproductive age, and, the combination of both diseases as comorbidities among women can be lethal. Hence, in the present study, we aimed to evaluate the prevalence of hypertension and type 2 diabetes mellitus both as comorbidity among women of reproductive age.<sup>15, 16</sup>

We reported an estimated 2% of young females of reproductive years to have diabetes and hypertension as comorbidity. We also reported a higher incidence of prediabetes in women who were either prehypertensive or hypertensive. Our findings are consistent with the previously published studies, indicating the trend of the past 3 decades about the global burden of hypertension and diabetes.<sup>17, 18, 19</sup> We focused on a subset of population i.e. women of reproductive age, which enabled us to highlight the emerging major health-care problem with respect to not only cardiovascular disease but also reproductive health and the prevention of adverse obstetrical outcomes in terms of the mother and the fetus.

Diabetic and hypertensive women who wish to conceive a baby, must be supported and encouraged to optimize their glucose control so that they can achieve their reproductive goals, and avoid any negative obstetrical outcome. In a systematic review and meta-analysis, Wahabi et al. revealed that preconception care for all women with preconception diabetes can reduce the relative risks of preterm birth, congenital birth defects, and neonatal mortality by 70%, 25%, and 35%, respectively.<sup>20</sup>

However, a detailed review by Tieu J. et al, claimed that further research is required to evaluate the optimal preconception care protocol.<sup>21</sup> We recommend that innovations in diabetes management should focus on the care and management of hypertension, diabetes as well as reproductive health.

To our knowledge, this is the first study to evaluate the prevalence of comorbid hypertension and diabetes among young women population using HbA1C-based diagnosis of diabetes mellitus type 2, in pakistani population-based sample.

**CONCLUSION:**

A high prevalence of hypertension and diabetes was observed among women in their reproductive years. Hypertension and diabetes increasingly affect women's health throughout their lifespan and often go undiagnosed. The growing prevalence of comorbid conditions during women's reproductive age is a threat to healthy neonatal and maternal outcome. Therefore, serious primary care intervention is needed to reduce prevalence and to improve awareness, detection and management of hypertension and diabetes as comorbid conditions.

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