

Association Between Contraception Use, Diabetes and Hypertension: Findings from Bangladesh Demographic and Health Survey

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Abstract

Background: The prevalence of chorionic conditions such as diabetes and hypertension is increasing among reproductive-aged women in Bangladesh. Pregnancy in women with uncontrolled chronic conditions may increase the risks of adverse consequences, including maternal and child morbidity and mortality. Appropriate contraception use can help women to prevent pregnancy until women have controlled chronic conditions and reduce the risks of adverse maternal and child health consequences. We investigate the associations between diabetes and/or hypertension and contraception use among reproductive-aged women in Bangladesh.

Methods: We analysed data of 3,947 women, extracted from the 2017/18 Bangladesh Demographic and Health Survey. Women's contraception using patterns were our outcome variable, which was classified as (i) any contraception method use *vs* no use, (ii) modern methods *vs* traditional methods or no use, (iii) modern methods *vs* traditional methods use. The explanatory variables were diagnosis of diabetes only, hypertension only or both diabetes and hypertension. The multilevel Poisson regression with robust variance was used to explore the associations.

Results

The overall prevalence of contraception use was 68.0% (95% CI: 66.3-69.7), 69.4% (95% CI: 61.8-76.1) in women with diabetes only, 67.3% (95% CI: 63.5-70.9) with hypertension only, and 62.0% (95% CI: 52.8-70.4) in women having both diabetes and hypertension. The prevalence of modern methods of contraception use was lower (46.4%, 95% CI: 37.4-55.6) and traditional methods use higher (16.6%, 95% CI: 13.8-16.8) in women who had both diabetes and hypertension than women who did not have these conditions. The fully adjusted regression model showed that the prevalence of traditional method use was 31% (95% CI: 1.02-2.01) higher in women having both diabetes and hypertension compared with their counterparts who had none of these conditions.

Conclusion: In Bangladesh, women with both diabetes and hypertension were more likely to use traditional contraception methods. These women are likely to experience increased risks of unwanted pregnancies and associated adverse maternal and child health outcomes.

Introduction

Chronic conditions such as diabetes and hypertension are rising in low- and middle-income countries (LMICs), including Bangladesh [1-3]. Such rises are even more evident among reproductive-aged women (15-49 years) due to an increasing prevalence of overweight and obesity in younger women [2, 3]. As overweight and obesity are major predictors of being diabetic and hypertensive [4], these potentially indicate a risk of the further rise of diabetes and hypertension among reproductive-aged women in the coming years.

Women with diabetes and hypertension are at increased risk of pregnancy-related complications, including pre-eclampsia, preterm labour, polyhydramnios, and increased operative deliveries [5]. They are also more likely to give birth to babies with congenital anomalies and stillbirths [6]. Studies showed that offspring whose mothers have such chronic conditions are more likely to develop diabetes and hypertension in their later lives [7], a pathway that further indicates a long-term disease burden. Because of these adverse pregnancies and birth outcomes, delaying pregnancies up to the time when mothers controlled these conditions is of utmost importance [8]. Thus, there is an urgency to ensure effective family planning and contraception use along with proper management of diabetes and hypertension.

A limited number of studies explored contraception use among women with diabetes and hypertension. Also, the findings are inconclusive due to substantial variation in study designs, sample sizes, and the number of chronic conditions as explanatory variables [9-14]. Furthermore, patterns of contraception use among women with diabetes and hypertension were not compared with women without such conditions [14]. These studies, therefore, offer limited information for formulating population-level policies and programs towards the promotion of contraception.

Previous studies in Bangladesh and other LMICs reported inadequate management of diabetes and hypertension, and a relatively high prevalence of unintended pregnancies (47%) due to the use of none or less effective contraceptives [2, 3, 15]. However, there are little data in LMICs, including Bangladesh, about the extent to which women with diabetes and/or hypertension use contraception. We, therefore, explored the contraception using patterns in women with and without diabetes and/or hypertension, and investigated the associations between these two chronic conditions and contraception use among reproductive-aged women in Bangladesh.

Materials And Methods

Study design

We analysed data from the most recent Bangladesh Demographic and Health Survey (BDHS) conducted in 2017/18. The survey was conducted by the DHS program of the USA. The National Institute of Population Research and Training of the Ministry of Health and Family Welfare of Bangladesh worked as a local partner. The survey was conducted by following the two-stage stratified random sampling method. At the first stage, 675 primary sampling units (PSUs) were selected randomly from a list of 293,579 PSUs, created as part of the most recent 2011 Bangladesh Population and Housing Census. Of them, the survey was not conducted in three PSUs due to extreme flooding there, leaving a total of 672 PSUs. In the second stage, 20,160 households were selected for data collection with 30 households from each selected PSU. Of them, the interview was completed in 19,457 households with a 96.5% inclusion rate. There were 20,376 eligible women in these selected households, and data were collected from 20,127 women. Informed consent was obtained from all participants. The contraception data was collected from each of these women. However, diabetes and hypertension-related data were collected from one-fourth of the selected households (7 to 8 households per PSU), which generated 4,864

households. Unlike contraception data, diabetes and hypertension data were collected from both males and females in the selected households aged 18 years and more. There were 14,704 respondents in these selected households, 12,924 of them (men: 5,583; women: 7,341) had blood pressure measured, and blood glucose tested. Details of the sampling procedure have been published elsewhere [16].

Analytic sample

Data of 3,947 women who met the following inclusion criteria were analysed in this study. The inclusion criteria were: (i) fertile women who were not pregnant or not in the post-partum amenorrhea period at the time of data collection and (ii) reported their blood pressure and blood glucose or their medication status to control blood pressure and/or blood glucose.

Outcome measures

Based on women's contraception using status (yes, no) and the type of methods they used (e.g., pill, condom, sterilization), we generated three different outcome measures: (i) no contraception use vs any contraception use (modern or traditional method), (ii) traditional method or no use vs modern method use, (iii) traditional method vs modern method use.

Explanatory variables and confounders

Women's diabetes and hypertension status were our main explanatory variables classified as none, diabetes only, hypertension only, and both diabetes and hypertension. Confounders were considered at the individual, household, and community-level factors based on previous relevant literature [2-4, 9, 11, 17]. Individual-level factors were women's age (≤ 19 years, 20-34 years, ≥ 35 years), education (no education, primary education, secondary education, higher education) and body mass index (BMI: underweight, normal weight, overweight, obese). We followed the World Health Organization (WHO) recommendation for the Asian population body mass index to classify women's BMI in this study [18]. Husband's education (no formal education, primary education, secondary education, higher education), number of children ever born (no child, 1-2 children, >2 children) and wealth quintile (poorest, poorer, middle, richer, richest) were the household level factors. The BDHS created the wealth quintile variable using the principal component analysis of women's responses on the households' durables goods such as materials to build houses, household ownership of radio/television. Women's place of residence (urban, rural) and administrative divisions (Barishal, Chattogram, Dhaka, Khulna, Mymensingh, Rajshahi, Rangpur, Sylhet) were community-level factors.

Statistical analysis

We reported frequency and percentage to describe the characteristics of the respondents. The prevalence of contraception in general and across diabetes and hypertension status of the women were calculated and reported with 95% confidence intervals (95% CI). We used multilevel mixed-effect Poisson regression with robust variance to determine the associations between the outcome and explanatory variables. We used Poisson regression because the odds ratio using logistic regression in cross-sectional studies may

significantly overestimate the effect size when the outcomes are common (e.g., prevalence >10%) [19, 20]. Secondly, in the dataset, individuals were nested within households; and households were nested within PSUs. This nested data structure generated multiple hierarchies and dependencies. The multilevel mixed-effects Poisson regression accounts for these multiple hierarchies and dependencies in data and the problem of overestimation [21]. We developed unadjusted and adjusted models (adjusted for individual, household, and community level confounders) for each of the three study outcomes. For instance, the first set of models examined the associations between women's status of chronic conditions and contraception use (no use *vs* any methods use). The second set examined the associations between women's status of chronic conditions and contraception use type (traditional methods/no use *vs* modern methods use). The third set examined the association with contraception method type (traditional methods *vs* modern methods use). Sampling weight and complex survey design were considered in all analyses. Results are reported as prevalence ratio (PR) with its corresponding 95% CI. Multicollinearity and interactions were checked. The study was designed and reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [22]. All methods were performed in accordance with the relevant guidelines and regulations. All analyses were performed using the statistical software package Stata (version 15.1; Stata Corp LP, College Station, TX, USA).

Results

The study included data from 3,947 women of reproductive age. Participants' mean age was 33 (SD ± 8.86) (Table 1). Around 20% of women did not receive formal education and 3% were nulliparous. At the time of the survey, over three-fourth of women were living in rural areas. Around half of the women were overweight/obese, 19.9% were hypertensive, 5.2% had diabetes and 3.6% had both diabetes and hypertension.

Table 1: **Characteristic of women of reproductive age 15-49 (n=3,947)**

Characteristics	Frequency (%)
Age	
15-19	231 (5.86)
20-34	1992 (50.46)
35-49	1724 (43.67)
Level of education	
No education	779 (19.75)
Primary	1326 (33.60)
Secondary	1440 (36.50)
Higher	401 (10.15)
Body mass index (kg/m²)	
Underweight	1517 (38.50)
Normal weight	463 (11.76)
Overweight	1362 (34.48)
Obese	605 (15.27)
Husband's education	
No formal education	903 (24.66)
Primary	1218 (33.26)
Secondary	1051 (28.71)
Higher	489 (13.36)
Wealth quintile	
Poorest	789 (19.99)
Poorer	831 (21.07)
Middle	825 (20.89)
Richer	757 (19.17)
Richest	745 (18.89)
Number of children ever born	

No child	119 (3.02)
1-2 children	1942 (49.19)
>2 children	1886 (47.80)
Place of residence	
Urban	1036 (26.25)
Rural	2911 (73.75)
Administrative divisions	
Barishal	225 (5.69)
Chattogram	675 (17.11)
Dhaka	931 (23.60)
Khulna	494 (12.52)
Mymensingh	300 (7.59)
Rajshahi	592 (15.00)
Rangpur	501 (12.69)
Sylhet	229 (5.80)
Chronic conditions	
None	2811 (71.20)
Diabetes only	206 (5.24)
Hypertension only	786 (19.92)
Both diabetes and hypertension	144 (3.64)

The prevalence of contraception use by women with diabetes and/or hypertension are presented in Table 2. Around 68.0% (95%CI: 66.3% - 69.7%) of women reported that they were using modern or traditional contraceptives. This percentage was 62.0% (95%CI: 52.8% - 70.4%) among women who had both diabetes and hypertension, and went down further when examined separately for modern contraceptive methods use (46.4%, 95%CI: 37.4% - 55.6%). The prevalence of modern contraception use was 56.4% (95%CI: 48.5% - 63.9%) among women with diabetes, 54.4% (95%CI: 50.3% - 58.4%) among women with hypertension and 46.4% (95%CI: 37.4% - 55.6%) among women who had both diabetes and hypertension.

Among modern contraception, oral contraceptive pills (27.2%, 95%CI: 25.6% - 28.9%) and injectables (12.4%, 95%CI: 11.2% - 13.7%) were dominant methods in all women as well as in women with diabetes only, hypertension only, or both diabetes and hypertension. The use of traditional contraceptive methods

increased from 11.1% (95%CI: 9.1% - 12.4%) among all women to 15.6% (95%CI: 13.8% - 16.8%) among women who had both diabetes and hypertension.

Table 2: Patterns of contraception use in Bangladesh, BDHS 2017-2018

Contraception methods	Contraception use prevalence (95% CI)				
	Overall	None of diabetes and hypertension	Diabetes only	Hypertension only	Both diabetes and hypertension
Any method	68.0 (66.3-69.7)	68.4 (66.4-70.4)	69.4 (61.8-76.1)	67.3 (63.5-70.9)	62.0 (52.8-70.4)
Modern methods	56.96 (55.1-58.8)	58.3 (56.2-60.4)	56.4 (48.5-63.9)	54.4 (50.3-58.4)	46.4 (37.4-55.6)
Oral contraceptive pills	27.2 (25.6-28.9)	27.6 (25.7-29.5)	18.5 (13.3-25.3)	29.1 (25.7-32.7)	21.3 (14.3-30.6)
Injectables	12.4 (11.2-13.7)	13.1 (11.7-14.7)	13.1 (8.7-19.3)	10.7 (8.6-13.4)	7.3 (3.8-13.8)
Condoms	7.5 (6.5-8.6)	8.0 (6.9-9.3)	11.8 (7.7-17.6)	4.4 (3.1-6.1)	7.8 (4.4-13.7)
Female sterilization	5.6 (4.7-6.5)	4.8 (4.0-5.8)	5.5 (2.9-10.1)	7.8 (5.8-10.3)	8.5 (4.7-14.9)
Male sterilization	1.2 (0.9-1.7)	1.2 (0.8-1.8)	2.5 (1.1-5.8)	1.2 (0.6-2.2)	0.3 (0.004-1.9)
Intra Uterine Device	0.6 (0.4-1.0)	0.7 (0.4-1.1)	1.5 (0.4-4.7)	0.4 (0.01-1.5)	0
Implants	2.5 (2.0-3.1)	2.9 (2.3-3.7)	3.5 (1.4-8.0)	0.9 (0.4-2.0)	1.1 (0.2-7.4)
Traditional methods	11.1 (9.1-12.4)	10.2 (9.2-11.6)	13.0 (11.9-14.5)	12.9 (10.8-13.9)	15.6 (13.8-16.8)
Periodic abstinence	7.8 (7.0-8.8)	7.0 (6.1-8.1)	10.7 (7.0-16.0)	9.3 (7.4-11.7)	11.3 (7.0-17.7)
Withdrawal	2.9 (2.3-3.5)	2.8 (2.3-3.6)	2.2 (0.8-5.6)	2.9 (1.9-4.5)	4.3 (1.8-10.1)
Other traditional methods	0.4 (0.2-0.7)	0.3 (0.1-0.7)	0.2 (0.002-1.5)	0.7 (0.3-1.6)	0
Currently not using	32.0 (30.3-33.7)	31.6 (29.6-33.6)	30.6 (23.9-38.2)	32.7 (29.1-36.5)	38.0 (29.63-47.2)

Note: World Health Organization's recommendation was used to group contraception methods

Both unadjusted and adjusted associations between contraceptive use and diabetes and/or hypertension using multiple mixed-effect Poisson regression models are reported in Table 3. Unadjusted models show that women who had both diabetes and hypertension were significantly more likely than women who had none of these conditions to report using traditional methods or no contraception (PR: 1.29, 95%CI: 1.08-1.53; p=0.005). Women who had hypertension only (PR: 1.30, 95%CI: 1.04-1.62; p=0.021) and who had both diabetes and hypertension (PR: 1.70, 95%CI: 1.14-2.52; p=0.008) were significantly more likely than their counterparts to report using traditional methods of contraception.

Table 3: **Unadjusted and adjusted associations between contraception use and diabetes and hypertension**

	Contraception methods					
	No use vs any methods use		Traditional methods or no use vs modern methods use		Traditional methods vs modern methods use	
	Unadjusted	Adjusted*	Unadjusted	Adjusted*	Unadjusted	Adjusted*
	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)	PR (95% CI)
	p-value	p-value	p-value	p-value	p-value	p-value
Chronic conditions						
None	1.00	1.00	1.00	1.00	1.00	1.00
Diabetes only	0.98 (0.76-1.23) p=0.785	0.88 (0.67-1.15) p=0.340	1.05 (0.87-1.25) p=0.625	0.95 (0.78-1.15) p=0.568	1.27 (0.86-1.85) p=0.225	1.08 (0.69-1.54) p=0.685
Hypertension only	1.04 (0.91-1.18) p=0.603	0.99 (0.84-1.15) p=0.744	1.09 (0.99-1.21) p=0.079	1.01 (0.90-1.13) p=0.991	1.30 (1.04-1.62) p=0.021	1.04 (0.84-1.30) p=0.706
Both diabetes and hypertension	1.20 (0.95-1.52) p=0.122	1.01 (0.75-1.36) p=0.960	1.29 (1.08-1.53) p=0.005	1.08 (0.88-1.34) p=0.462	1.70 (1.14-2.52) p=0.008	1.31 (1.02-2.01) p=0.005

Note: PR = Prevalence ratio; CI=Confidence Interval

*Models were adjusted for women's age, education, body mass index, husbands' education, wealth quintiles, number of children ever born, place of residence and administrative divisions.

When models were adjusted for women's age, education, BMI, husbands' education, wealth quintiles, number of children, place of residence and administrative divisions, most of the associations reported in the unadjusted disappeared except for the traditional contraception use. We found a 31% (aPR: 1.31, 95% CI: 1.02-2.01) higher prevalence of traditional contraceptive methods use among women who had both diabetes and hypertension compared with women who did not have diabetes or hypertension.

Discussion

In this study of a nationally representative sample of 3,947 reproductive-aged women, the prevalence of hypertension and diabetes were around 20% and 5%, respectively. Almost 4% of women had both diabetes and hypertension. No use or traditional contraceptive methods use were found to be higher in women with these chronic conditions. The prevalence of traditional contraception method use was 31% higher in women who had both diabetes and hypertension compared with women who had none of these conditions, following the adjustment of individual, household, and community-level factors. To our best knowledge, this is a novel and useful finding for Bangladesh and other LMICs. As traditional contraceptive methods increase the risk of unintended pregnancy, adverse pregnancy and birth outcomes, this study findings have policy implications about ensuring the use of modern contraception methods in women with chronic conditions.

Although our study found a relatively low prevalence of hypertension (20%) and diabetes (5%) compared to the national prevalence (27.4% and 9.8%, respectively) among women [2, 3], the prevalence of diabetes and hypertension in women of reproductive age are gradually increasing in Bangladesh [2, 3, 16]. These chronic conditions have a range of adverse consequences; for instance, hypertensive disorders are the third major cause of maternal mortality in LMICs [23]. The consequences could be aggravated further if women have both diabetes and hypertension. Much of these adverse consequences are preventable by ensuring planned pregnancies among women with diabetes and hypertension [8]. However, this is quite challenging in LMICs, including Bangladesh, because of the low prevalence of contraceptive use, financial difficulties, and stigma and misconception associated with pregnancies among women with diabetes and/or hypertension [14, 24]. Well-designed programs are needed for effective management of diabetes and hypertension along with appropriate family planning services to delay pregnancies until women are ready for conception [25].

Around 32% of women in our study did not use contraception and 11% depended on traditional contraception methods. Previous studies identified several reasons for such high levels of traditional contraception methods use or no use, including (i) lack of awareness of the importance of contraception use, (ii) difficulties in accessing contraception from government-run sources, and (ii) financial difficulties in accessing contraception from private sources, or combinations of these factors [24, 26]. A misconception that the religion Islam (religion of over 90% of people in Bangladesh) does not permit contraception use is also a common barrier to the access and use of contraception [24]. The cumulative effects could worsen the situation for women with diabetes and hypertension, as the findings of our study suggest. The effective management of diabetes and hypertension needs continuous treatment,

medication and visits to healthcare facilities [27]. All these can create economic burdens because management care for diabetes and hypertension is mainly available at private healthcare facilities, which are generally expensive [3]. Additional expenses associated with contraception could be a further barrier. Moreover, the healthcare facilities that provide care for the management of diabetes and hypertension are usually separate from the healthcare facilities that deliver family planning services [28]. Women may not receive counselling for contraception use due to the exclusive focus on the management of diabetes and hypertension [28]. These fragmented services affect women's knowledge of the importance of using effective contraception and the risk of becoming pregnant until they have controlled chronic conditions. Bangladesh should prioritize initiatives to ensure contraception counselling and distribution as part of diabetes and hypertension management care [29-31].

Literature suggests that most modern contraceptive methods are suitable for women with diabetes and hypertension [32]. However, misunderstandings are common; for instance, a significant percentage of women believe contraception use, particularly pills and condom use, elevates blood glucose and blood pressure [13]. Some women with diabetes and/or hypertension may also incorrectly perceive that contraception use can inhibit ovulation (such as polycystic ovary disease) and make them infertile [33]. Another misapprehension is that chronic diseases reduce women's fertility, and thereby effective contraception use is considered unnecessary [9]. Intrauterine devices and vaginal devices are considered risky for women with diabetes and hypertension, as they need to be inserted through surgical operation. Moreover, women with chronic conditions may desire pregnancy, however, they may not be sure about the time because of their inadequate knowledge on whether conception would put them at risk [9, 11]. This ambivalence about timing is associated with non-use or traditional contraception methods use [24]. It is also possible that women with uncontrolled diabetes and hypertension are sexually less active and thus do not use contraceptives [14]. Besides, as there are some potential risks of using hormonal contraception in certain patients with metabolic syndrome, fear of exacerbating the disease may prevent some clinicians from recommending contraception [34]. Our results could be a confluence of all these factors. While further research is needed to identify the precise reasons for low use, our findings suggest the need for targeted policies and programs to reduce misunderstandings about contraception use by women with chronic conditions to prevent conception and related misconceptions.

The current study has several strengths. We analyzed a large nationally representative and thus our findings have external validity. Also, that diabetes and hypertension were measured using high-quality techniques and they were classified in this study following the WHO guidelines. The BMI was classified following the WHO recommendation for the Asian population. The analytical approach we used considered the hierarchical structure of the data and avoided the chance of effect-size overestimation that may occur if conventional logistic regression is employed in cross-sectional studies. We adjusted the regression models for a wide range of confounding factors. This study also has some limitations. As we analysed cross-sectional data, the findings are correlational only. Another limitation was possible reporting bias in diabetes and hypertension status, which were self-reported. However, any such reporting error is likely to be random.

Conclusion

In Bangladesh, women with both diabetes and hypertension were more likely to use traditional contraception methods. These women are likely to experience increased risks of unwanted pregnancies and associated adverse maternal and child health outcomes. Targeted policies and programs should be undertaken to ensure modern contraception use among women having both of these chronic conditions. Contraception should also be included in diabetes and hypertension management care for reproductive-aged women.

Abbreviations

LMICs: Low- and middle-income countries; BDHS: Bangladesh Demographic and Health Survey; NIPORT: National Institute of Population Research and Training; OR: WHO: World Health Organization, PR: Prevalence Ratio.

Declarations

Ethics approval and consent to participate: The survey analysed was approved by the institutional review board of ICF and the National Research Ethics Committee of the Bangladesh Medical Research Council. Informed consent was obtained from all participants. All necessary patient/participant consent has been obtained and the appropriate institutional forms have been archived. No separate ethical approval was required to conduct this study. We obtained permission to access this survey and conduct this research. All methods were performed in accordance with the relevant guidelines and regulations.

Consent for publication: Not applicable

Availability of data and materials: The data that support the findings of this study are available from The DHS Program, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are, however, available from the authors upon reasonable request and with permission of The DHS Program (<https://dhsprogram.com/data/>).

Conflict of interest: None.

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Authors' contributions: Khan MN and Islam MM designed the study. Khan MN performed the data analysis with the help of Islam MM and Islam RM. Khan MN wrote the first draft of this manuscript. Islam MR and Islam MM critically reviewed and edited the previous versions of this manuscript. All authors approved this final version of the manuscript.

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