

# Factors Influencing Waiting Time to First Conception in Women with Different BMI: Insights from the Bangladesh Demographic and Health Survey 2022 Data

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**Abstract** Maternal nutrition is a prerequisite for safe conception, safe motherhood, and a healthy nation. This study aims to investigate the differences in the waiting time to first conception among different categories of nutritional status of ever-married women in Bangladesh. A total of 8374 women aged 15-49 were sampled from the Bangladesh Demographic and Health Survey (BDHS) 2022. The mean waiting time to first conception of a woman is found to be  $23.21 \pm 25.09$  months without censored cases. Women who are overweight take a relatively longer time to conceive than other women. The results from Kaplan-Meier analysis, Log Rank test, and Cox Proportional Hazard model indicate that geographical region, respondent's education, partner's education, decision maker for using contraception, age at first marriage, spousal age difference, and marital duration are significant determinants of the timing of first conception. The results of this study confirm that body mass index (BMI) is the most salient factor in determining the timing of first conception and that women with a healthy BMI have a faster transition to conception than those who are underweight or overweight.

**Keywords** Conception wait, Body mass index, Kaplan-Meier Survival analysis, Cox proportional hazard model

## 1. Introduction

An improved health status of a woman during her reproductive years confirms an enhanced health status of the country. The advancement of maternal physical and mental health is necessary to improve child health along with to alleviate the national health burden [1]. Bangladesh, a developing and densely populated country, faces a significant nutritional challenge. There are many underweight women in rural areas and urban slums of Bangladesh [25,12]. However, the prevalence of underweight is decreasing day by day, while the prevalence of overweight is an alarming condition that confirms the double burden of malnutrition during women's reproductive years [15,17]. A similar scenario can be observed in most developing countries. Specifically, overweight and obesity are more prevalent than underweight in women [19].

A study demonstrated, the first birth interval can provide an indication of nutritional status. There is a relationship between women's body mass index (BMI) and their fertility, with both underweight and overweight/obese women facing greater challenges in conceiving [20]. Another research found that being underweight or overweight can have a negative

impact on fertility [31]. In fact, women who are underweight or overweight take longer to get pregnant [5,6,9,32]. Previous study has explored that obesity is the key reason for sub-fecundity [22]. Maternal obesity has been associated with a delayed time to conception, an increased risk of gestational diabetes, an increased likelihood of caesarean section, and an increased risk of stillbirth [30].

Conception is a sign of becoming a mother and the time to pregnancy is linked to women's fertility patterns. The timing of first conception is a valuable indicator for understanding and measuring women's fertility behavior. In Bangladeshi society, women usually want to have a child as soon as they get married. Despite this, the mean waiting time to conception in Bangladesh is around 19 months, which is longer than in other low-fertility populations [13]. Since child marriage is a prevalent social phenomenon in Bangladesh, most married women are not physically mature enough to become pregnant shortly after marriage [24]. Consequently, a negative correlation is observed between age at first conception and age at first marriage [2].

There are numerous studies in the literature on waiting time to conception and related issues, of which only a few were conducted in Bangladesh [2,13] and most in other countries [27,7,23,14]. Waiting time to conception is influenced by a variety of factors, including place of residence, region of residence, education, age at first marriage, exposure to mass media and BMI [13,29]. In addition, the socioeconomic

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status and occupation of respondents and their partners influence the timing of first motherhood [3]. Contraceptive use and menstrual cycle length are also significantly associated with the time to pregnancy [4,28].

Based on a comprehensive literature review, we can claim that few studies have examined the effects of covariates on waiting time to conception among women with different BMIs, and no such study exists for Bangladesh. However, if we can find out to what extent the waiting time for conception varies among women categorized by BMI, proper initiatives such as treatment and counselling can be taken to prevent delayed pregnancy. The objective of this study is to examine the timing of first conception in underweight and overweight /obese women and the factors influencing it in the context of Bangladesh.

## 2. Materials and Methods

### Source of Data

The study uses a secondary data source, Bangladesh Demographic and Health Survey (BDHS), 2022. This survey is a part of the worldwide Demographic and Health Survey. The 2022 BDHS was conducted under the authority of the National Institute of Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare. The 2022 BDHS is a countrywide survey with a nationally representative sample of approximately 30,078 ever-married women aged 15-49, to evaluate health and demographic indicators, mainly maternal and child well-being, fertility, family planning, and nutritional status at the national and divisional levels. All participants of the study were provided an informed consent before conducting the survey. One third of the selected households were considered for anthropometric measurement in BDHS 2022.

To carry out the research, we investigated 8374 married women between the ages of 15 and 49. Currently, pregnant women are excluded to represent their nutritional status, and women who had ever had a terminated pregnancy are also omitted to better represent the first conception wait.

### Formation of the variable "Timing of First Conception"

To determine the "Timing of First Conception" for Bangladeshi women, 8374 respondents from 30,078 were chosen. To generate the variable, the whole dataset is first subdivided into two files: birth and no birth, which comprise 7617 and 757 respondents, respectively. The time to first conception is then calculated from both files and pooled to create a status variable with values of 0 for no birth happened and 1 for at least one birth.

From the birth file, the first conception wait is calculated by using the following formula

$$\begin{aligned} \text{Conception Wait (Closed interval)} &= \text{Date of first} \\ &\text{birth (CMC)} - 9(\text{Gestation period in months}) \\ &- \text{Date of first marriage (CMC)} \end{aligned}$$

From no birth file, the first conception wait is calculated

by using two formulae considering closed interval and exposure interval (regarded as censored cases).

Date of first conception = CMC pregnancy ended – Month pregnancy ended

Conception Wait (Closed interval) = Date of first conception – Date of first marriage

Exposure Interval (Open Interval) = Date of Interview (CMC) – Date of first marriage

### Factors Influencing Time to first Conception

To assess the influential characteristics of women's first conception waits with different categories of nutritional status several cultural, socioeconomic, and demographic variables have been considered. Living environment, geographical region, and religion are considered cultural variables. To measure the socio-economic effect the study included some important variables like respondent education (illiterate, primary, secondary, and higher), respondent currently working, husband's education, husband's occupation (Agriculture, Business, service, and others), access to mass media, socio-economic status, decision making autonomy, and decision maker for using contraception. Three variables are used to measure decision-making autonomy: The person who usually decides on: the respondent's health care, the Person who usually decides on: large household purchases, and the Person who usually decides on: visiting family or relatives. The decision making autonomy is formed and coded as 0= "no decision taken", 1= "one decision taken", 2 = "two decision taken" and 3= "three decision taken" [26]. Age at first marriage, spousal age difference and marital duration are considered for demographic variable.

### Statistical analysis

In this analysis, descriptive statistics were employed to detect the mean difference in first conception wait among different categories of BMI. Normally, survival data are not fully observed but rather censored. Some individuals are still alive at the end of the study or analysis so the event of interest has not occurred. Therefore, right censored data are present. The Kaplan-Meier method [16], also known as the "product limit method", is a non-parametric method used to estimate the probability of survival past given time points (i.e., it calculates a survival distribution). Kaplan-Meier survival analysis and Log-Rank test are applied to present the survival curves and to test significant difference in survival curves among different independent variable groups [10,18]. To estimate the significant factors that influence the timing of first conception Cox-proportional hazard analysis is used [8]. This method is applied to identify the risk or prognostic factors relative to baseline hazard function. The analysis is carried out using SPSS 26.0.

## 3. Results

In this study, we attempt to find the differentials of the timing of first conception for different nutritional status categories. Table 1 shows that the overall mean of first conception wait

is 23.21 months with a standard deviation of 25.09 months who has at least one live birth. The distribution of the first conception wait is positively skewed and highly leptokurtic, as directed by the skewness and kurtosis values of 2.72 and 11.58, respectively. About 50% of women take 16 months for first conception while 25% women conceive after 31 months. Considering all the respondents, the average time to conception is found highest among underweight and overweight women, 25.62 months and 27.61 months respectively that the normal weight women (24.67 months).

Table 2 provides the information about the mean difference for survival time of the time to first conception in the three levels of BMI: underweight, Normal weight and overweight. Among the three levels of BMI, the mean for survival of timing of first conception wait is found highest (37.213 months) in the underweight cohort. Significant differences have been noticed among different background categories of the nutritional status of ever-married women in Bangladesh. The overall mean survival time for first conception of overweight women is 33.767 months while the women having normal weight take only 29.730 months.

The women in urban areas have to wait little longer than in rural areas in all the group of nutritional status. The mean survival timing of first conception of underweight women is highest in Khulna (46.237 months) division and lowest

in Rajshahi (26.730 months) division. The mean survival timing of first conception of normal weight and underweight women is highest in Rajshahi division. Muslim women have waited longer than non-Muslim.

**Table 1.** Descriptive statistics of conception wait among ever-married women in Bangladesh

Descriptive characteristics	Statistic
Mean (Overall)	23.21
Median (Overall)	16.00
Standard deviation (Overall)	25.09
Skewness (Overall)	2.72
Kurtosis (Overall)	11.58
1 <sup>st</sup> quartile (Q <sub>1</sub> ) (Overall)	7.00
2 <sup>nd</sup> quartile (Q <sub>2</sub> ) (Overall)	16.00
3 <sup>rd</sup> quartile (Q <sub>3</sub> ) (Overall)	31.00
Mean (Underweight)	25.62 (10.4%)
Standard deviation (Underweight)	39.66
Mean (Normal weight)	24.67 (52.9%)
Standard deviation (Normal weight)	33.39
Mean (Overweight)	27.61 (36.7%)
Standard deviation (Overweight)	35.55

Note: % indicate the number of respondent in that category

**Table 2.** Mean for survival time of first conception wait by some selected background characteristics into different categories of BMI and log rank test statistics for equality of survivor functions

Types of variable	Background Characteristics	Mean for Survival time of first conception wait						Chi-square Statistic	P-value
		Underweight		Normal weight		Overweight			
		Mean	Standard Error	Mean	Standard Error	Mean	Standard Error		
Cultural variable	<b>Living environment</b>								
	Urban	40.916	6.903	29.911	1.515	33.637	1.930	0.595	0.440
	Rural	35.605	3.268	29.451	1.039	32.550	1.438		
	<b>Geographical region</b>								
	Barisal	29.925	5.023	28.807	1.886	35.390	2.654	97.381	0.000
	Chattogram	28.126	5.011	22.980	1.562	23.787	2.172		
	Dhaka	29.413	3.468	31.367	2.229	32.782	2.466		
	Khulna	46.237	14.233	26.467	1.576	35.380	2.984		
	Mymensingh	33.969	4.747	31.161	1.911	30.836	2.409		
	Rajshahi	26.730	2.979	34.679	3.018	37.286	3.805		
	Rangpur	32.296	6.109	28.513	1.871	35.244	3.213		
	Sylhet	40.578	7.902	28.040	2.578	27.874	2.958		
	<b>Religion</b>								
Muslim	37.006	3.239	30.093	0.927	34.679	1.393	8.082	0.004	
Other	32.698	5.957	25.584	2.204	24.969	1.767			
Socio – economic variable	<b>Respondent education</b>								
	Illiterate	62.335	9.210	40.509	2.884	30.886	3.249	57.009	0.000
	Primary	22.313	1.558	27.475	1.036	33.944	2.194		
	Secondary	29.594	3.053	25.286	1.027	31.164	1.528		
	Higher	26.531	2.748	28.816	1.676	30.833	1.417		

	<b>Respondent currently working</b>								
	No	29.708	2.407	28.232	0.988	31.151	1.248		
	Yes	46.455	6.276	31.658	1.504	36.704	2.424	10.881	0.001
	<b>Husband's education</b>								
	Illiterate	51.499	6.555	36.863	2.127	35.778	3.014		
	Primary	26.263	2.525	24.630	1.054	28.666	1.875		
	Secondary	24.964	2.818	25.661	1.048	31.719	1.833		
	Higher	25.625	2.192	29.366	1.734	33.153	1.634	60.103	0.000
	<b>Husband's occupation</b>								
	Agriculture	25.346	2.268	29.718	1.552	34.018	2.417		
	Business	34.591	5.495	28.295	1.744	31.729	2.274		
	Service	24.229	1.787	24.086	0.961	28.764	1.148		
	others	52.326	7.015	32.788	1.712	35.633	2.586	7.573	0.056
	<b>Access to Mass Media</b>								
	No	42.719	4.759	28.199	1.125	33.783	2.212		
	Yes	27.568	2.225	30.440	1.189	32.399	1.308	0.578	0.447
	<b>Socio economic status</b>								
	Poor	40.148	4.229	30.154	1.378	31.994	1.985		
	Middle	29.589	3.544	27.233	1.532	34.628	2.944		
	Rich	26.247	2.455	30.133	1.394	32.256	1.462	0.762	0.683
	<b>Decision making autonomy</b>								
	No decision taken	67.273	10.001	37.656	2.669	32.759	2.265		
	One decision taken	23.612	3.513	25.456	1.298	33.032	3.314		
	Two decision taken	25.691	4.379	25.255	1.787	34.708	3.210		
	Three decision taken	27.157	2.179	28.320	0.990	31.687	1.433	27.590	0.000
	<b>Decision maker for using contraception</b>								
	Respondent	21.212	1.174	20.741	0.781	22.965	1.477		
	Husband	28.861	2.656	22.385	0.943	26.676	1.516		
	Joint decision	26.400	3.199	23.319	1.050	28.763	1.530		
	Others	141.285	4.755	34.498	1.271	34.059	1.447	126.290	0.000
	<b>Age at first marriage (Years)</b>								
	10 to 14	34.841	4.177	33.042	1.402	35.494	2.042		
	15 to 19	32.810	3.043	28.087	1.118	29.773	1.369		
	20 & above	38.933	7.219	27.556	2.380	38.443	3.310	55.751	0.000
	<b>Spousal age difference (Years)</b>								
<b>Demographic variable</b>	<6	28.164	2.418	26.406	0.920	34.219	1.961		
	6-10	24.740	1.982	27.729	1.375	32.550	2.116		
	11 and above	56.131	7.733	34.476	1.854	30.174	1.488	9.185	0.010
	<b>Marital duration (Years)</b>								
	0 - 5	19.014	1.174	20.741	0.781	22.965	1.477		
	6 - 10	27.958	2.656	22.385	0.943	26.676	1.516		
	11 - 15	28.207	3.199	23.319	1.050	28.763	1.530		
	16 and more	43.958	4.755	34.498	1.271	34.059	1.447	90.743	0.000
	<b>Overall</b>	<b>37.213</b>	<b>3.067</b>	<b>29.730</b>	<b>0.875</b>	<b>33.767</b>	<b>1.272</b>		

At the level of education, illiterate women usually take more time for their first pregnancy among underweight and normal weight women, which are 62.335 months and 40.509 months respectively. There is a slight differences have observed among the different level of respondent education in overweight women. Respondent working status plays a crucial role in their reproductive behaviour. It is clearly stated from the table that the timing of first conception of working women is relatively longer than the women who do not engaged with work for wages. Like women education, the variation due to husband’s education shows that, the underweight women and normal weight women, whose husbands are illiterate, take relatively longer time to conceive, at 51.499 months and 36.863 months respectively. The overweight women whose husbands are illiterate also take relatively longer period (35.778 months) to conceive than the others. There is significant differences of first conception have been observed from table 2 due to husband occupation. The study supports that the decision making autonomy and decision maker for using contraception influence the timing of first conception. The underweight and healthy women, who take no decision, had longer waiting time to first conception 67.273months and 37.656 months respectively than the other group. The overweight women who take three decisions, had relatively shorter waiting time than the women who can take at least two decisions. It is notable from table 2, the mean conception wait is higher among women where other takes the decision for using contraceptive method.

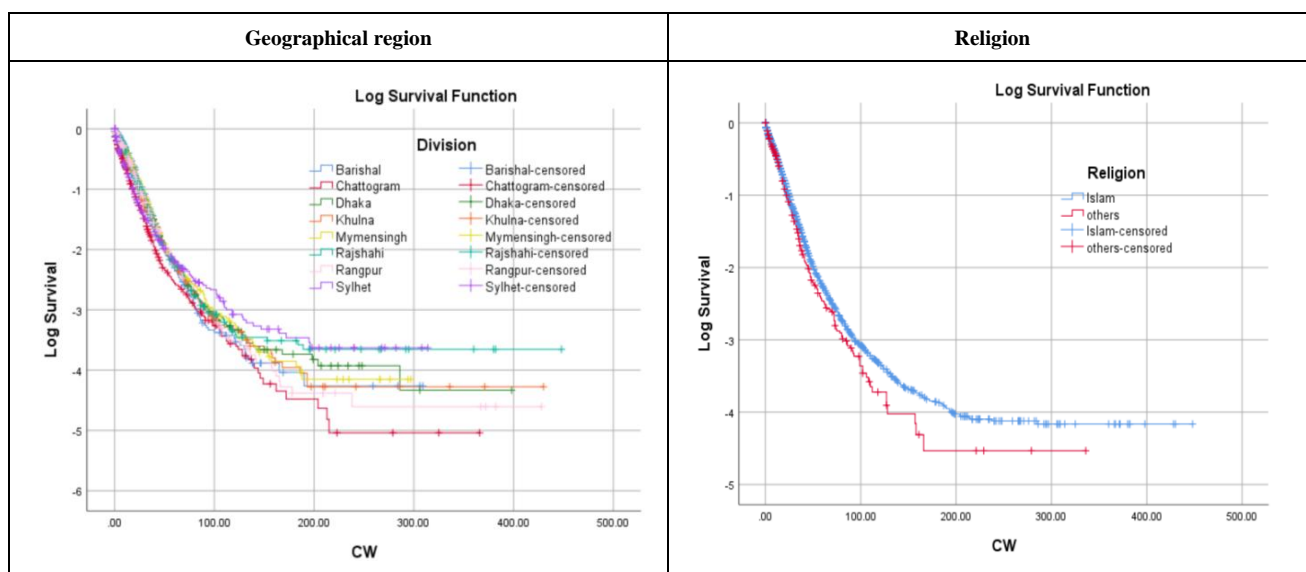
Some important demographic factors also influence the first conception wait of ever- married women. The mean survival time of conception wait of underweight and overweight women are highest, 38.9333 months and 38.443 months respectively who marry at 20 and above years. The underweight and normal weight women whose spousal age difference is 11 and above years, take 56.131 months and

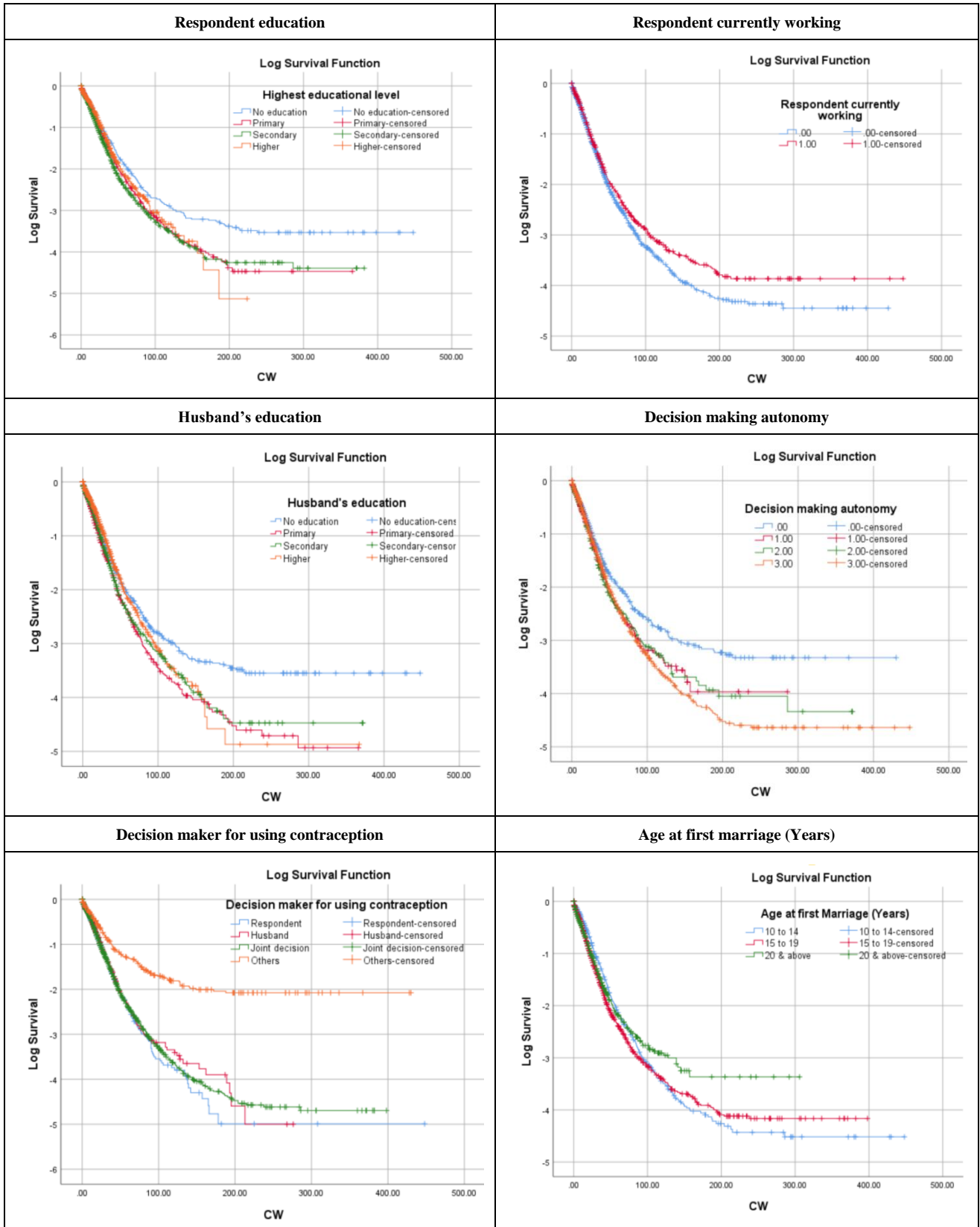
34.476 months which are highest from the other group. Marital duration is also positively associated with the mean conception wait.

From the above discussion, it can be clearly stated that significant mean differences have been found among different levels of BMI. Among the 14 independent variables, the log rank test provides the information that the survival experience is different in each group for 10 variable at  $p < 0.05$  (geographical region, religion, respondent education, respondent currently working, husband education, decision making autonomy, decision maker for using contraception, age at first marriage, spousal age difference and marital duration).

**Kaplan-Meier survival curves**

Kaplan-Meier Survival curves are used to see the dissimilarity of the survival curves for different levels of different covariates of the significant variables found in log-rank test. Figure 1 depicts the log of survival function of timing of first conception among different characteristics which were found significant in log rank test. There is a substantial changes have been found among the survival curves of different geographical region. The probability of surviving is higher among Muslim religion than the others religion. Education plays a key role of women reproductive characteristics. Educated women are more conscious about their health status than illiterate women. So, they try to get married after reaching the legal age and decide about their first motherhood, considering their health status. The survival curve for respondent education showed a decreased fecundity rate for illiterate women. The husband’s education also found significant differences among the survival curves of different categories. The survival curves of decision making autonomy and decision maker for using contraception are not similar for different categories. Women who did not take the decision for using contraception want to give child later than who take the decision by herself or husband or joint decision.





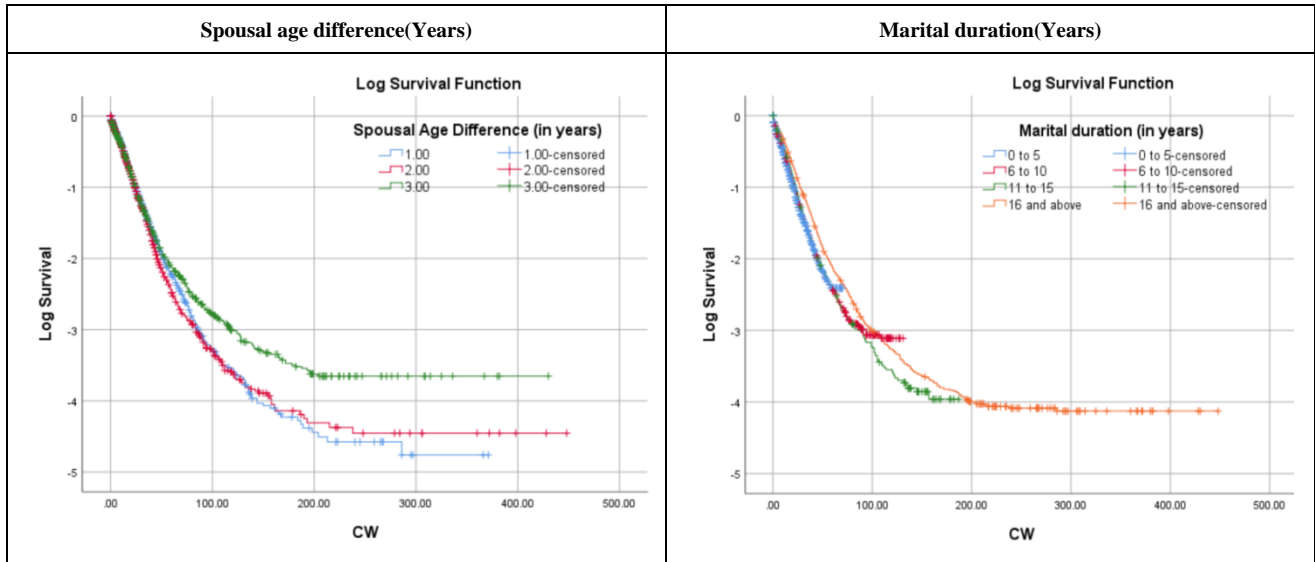


Figure 1. Survival curves of the first conception wait with different background characteristics

Age at first marriage is one of the most important factors for determining the timing of first conception in our country. Because women are susceptible to conception after marriage in our country. It is obvious from Figure 1 that the survival rates are not similar for different age cohorts. From the above curve, we also elucidated that the survival probability of underweight and overweight respondents is higher among the women who marry at 20 and above years. The spousal age difference and marital duration are also associated with the timing of first conception wait, the survival rates are not similar for the three different categories of the respondents.

### Cox Proportional Hazard Model Analysis for different categories of BMI

In this section, we constructed three Cox Proportional Hazard Models to find the independent effects on timing of first conception. Underweight women are considered in **Model-1**, normal-weight women in **Model-2**, and **Model-3** is constructed regarding overweight women. From table 3, geographical region is found significant in normal weight and overweight women. The results confirm that, the women in the Dhaka division have a higher probability of conception than the Barisal Division. The overweight women with other religion are less likely (OR= 0.877) to conceive earlier than the Muslims women.

There is dissimilarity among Respondents' education of different categories of BMI. We have found a significant effect of education on underweight and normal-weight women. The literate respondents are more likely to conceive earlier than illiterate women in the underweight and normal weight categories. Husband's education is also significantly associated with the timing of first conception wait of normal weight and overweight women. Like the results of respondent education, the women whose husbands are literate are more likely to conceive earlier than the women whose husbands are illiterate. Decision maker for using contraception was

found highly significant in all the three levels of BMI. The women who take decision for using contraception, are less likely to conceive than the decision taken by husband or joint decision or others.

As expected, age at first marriage is considered as a predominant factor for determining the conception wait is also statistically significant. Underweight women who got married at 15 to 19 years old have a 1.012 times higher probability of timing of first conception than the women who marry at 10 to 14 years, followed by 20 years and above (OR= 1.138). The normal weight women (OR=0.772) and the overweight women (OR=0.933) with age at first marriage 15 to 19, were also less likely to conceive than the women whose age at first marriage are 10 to 14 years. The first conception weight of the overweight respondents is found significantly influenced by their age differences with their partner's. The overweight women with higher age group 13% for 6 to 10 years and 5% for 11 and above years respectively, lower risk of first conception than the shorter spousal age difference. Furthermore, marital duration is also found an influential factor timing of first conception. It was observed from our study that the women whose marital duration is 6 years or more have more chance to conceive first as compared to the women whose marital duration is less than six years.

From the aforementioned results we have seen that decision maker for using contraception, age at first marriage, and marital duration have found significant effect on women's waiting time to first conception among all the categories of BMI. Geographical region and husband's education have found significant effect on both normal weight and overweight women. The underweight and normal weight women were also associated with respondent education. Religion and spousal age difference were found significant in overweight group. So it is worth noting that the timing of first conception wait is varied considerably in different categories of BMI.

**Table 3.** Cox proportional Hazard model estimates of the effects of selected background characteristics on first conception wait into different categories of BMI of women in Bangladesh, 2022

Background characteristics	Model-1 (Underweight)			Model-2 (Normal weight)			Model-3 (Overweight)		
	Coefficient	Hazzard Ratio	P-value	Coefficient	Hazzard Ratio	P-value	Coefficient	Hazzard Ratio	P-value
<b>Geographical region</b>			<b>0.178</b>			<b>0.000</b>			<b>0.000</b>
Barisal (Ref.)									
Chattogram	-0.301	0.740	0.062	-0.217	0.805	0.002	-0.226	0.798	0.010
Dhaka	-0.025	0.975	0.871	0.057	1.058	0.383	0.185	1.203	0.023
Khulna	-0.279	0.756	0.073	-0.220	0.803	0.001	-0.089	0.915	0.275
Mymensingh	-0.367	0.693	0.031	-0.058	0.944	0.395	-0.151	0.860	0.073
Rajshahi	-0.293	0.746	0.038	-0.215	0.806	0.001	-0.142	0.868	0.133
Rangpur	-0.259	0.772	0.083	-0.180	0.836	0.008	-0.134	0.874	0.111
Sylhet	-0.299	0.741	0.051	-0.115	0.891	0.085	-0.146	0.864	0.101
<b>Religion</b>			<b>0.719</b>			<b>0.365</b>			<b>0.036</b>
Muslim (Ref.)									
Other	0.046	1.048	0.719	-0.047	0.954	0.365	-0.132	0.877	0.036
<b>Respondent education</b>			<b>0.019</b>			<b>0.000</b>			<b>0.346</b>
Illiterate (Ref.)									
Primary	-0.163	0.850	0.407	-0.031	0.969	0.689	-0.006	0.994	0.953
Secondary	0.208	1.232	0.233	0.089	1.093	0.201	-0.055	0.946	0.482
Higher	0.097	1.102	0.531	0.176	1.193	0.003	0.034	1.035	0.602
<b>Respondent currently working</b>			<b>0.550</b>			<b>0.187</b>			<b>0.592</b>
No (Ref.)									
Yes	0.051	1.052	0.550	-0.046	0.955	0.187	0.022	1.022	0.592
<b>Husband's education</b>			<b>0.271</b>			<b>0.000</b>			<b>0.000</b>
Illiterate (Ref.)									
Primary	0.319	1.376	0.069	0.244	1.277	0.000	0.320	1.377	0.000
Secondary	0.243	1.275	0.147	0.259	1.296	0.000	0.260	1.297	0.000
Higher	0.294	1.341	0.067	0.160	1.174	0.005	0.156	1.169	0.009
<b>Decision making autonomy</b>			<b>0.725</b>			<b>0.072</b>			<b>0.840</b>
No decision taken (Ref.)									
One decision taken	-0.119	0.888	0.263	0.011	1.011	0.817	0.050	1.052	0.438
Two decision taken	-0.056	0.946	0.651	-0.033	0.968	0.520	0.010	1.010	0.877
Three decision taken	-0.059	0.943	0.656	0.117	1.124	0.017	-0.017	0.983	0.754
<b>Decision maker for using contraception</b>			<b>0.000</b>			<b>0.000</b>			<b>0.000</b>
Respondent (Ref.)									
Husband	1.267	3.549	0.000	0.565	1.759	0.000	0.676	1.966	0.000
Joint decision	1.036	2.819	0.000	0.518	1.679	0.000	0.559	1.749	0.000
Others	1.076	2.932	0.000	0.595	1.813	0.000	0.547	1.727	0.000
<b>Age at first marriage (Years)</b>			<b>0.000</b>			<b>0.000</b>			<b>0.001</b>
10 to 14(Ref.)									
15 to 19	0.936	1.012	0.012	-0.258	0.772	0.000	-0.069	0.933	0.317
20 & above	0.319	1.138	0.129	-0.093	0.911	0.066	0.091	1.095	0.125
<b>Spousal age difference (Years)</b>			<b>0.224</b>			<b>0.496</b>			<b>0.011</b>
<6 (Ref.)									
6-10	-0.169	0.844	0.096	-0.024	0.976	0.573	-0.148	.863	0.003
11 and above	-0.058	0.944	0.557	0.021	1.021	0.609	-0.055	.946	0.244
<b>Marital duration (Years)</b>			<b>0.001</b>			<b>0.000</b>			<b>0.013</b>
0 - 5(Ref.)									
6 - 10	0.424	1.529	0.000	0.278	1.320	0.000	0.217	1.242	0.005
11 - 15	0.131	1.140	0.281	0.254	1.289	0.000	0.131	1.140	0.023
16 and more	0.090	1.094	0.479	0.213	1.237	0.000	0.070	1.073	0.173

Ref. indicates the reference category.

## 4. Discussion

The strength of this study is that it analyzed a nationally representative and reliable data set and studied the extremes of BMI simultaneously and its influence on time to first pregnancy among ever-married non-pregnant women in Bangladesh using various sophisticated statistical techniques.

In this study, we report the time to first pregnancy can be used as a measure of women's nutritional status by testing whether overweight and underweight women take a longer time to conceive than healthy women. There is a significant effect of nutritional status on the time to first conception among ever-married women in Bangladesh is a topic of concern with wide-ranging consequences for reproductive health status. This research suggested inadequate nutritional status is one of the dominant factors for a prolonged time to first conception. Though underweight is decreasing but the prevalence of overweight is increasing at an alarming rate. The findings of the research also suggest that malnourished (overweight and underweight) women take more time for their first conception than healthy women. This results agree with some previous research that have shown increases infertility among overweight women [5,31]. Obesity in women can affect regular hormonal cycles, affecting irregular ovulation and menstrual periods, which can make conception more challenging.

The timing of the first conception varies in different geographical regions as the privilege of education, medical treatment, and working opportunities are not uniform among different geographical regions. Another study also confirm that the fertility pattern varies with different locations [11]. The present study hints that a significant effect has been found on time to first pregnancy with respondent's schooling. Higher levels of educational status have been linked with a tendency to start the family earlier. Educated women are more likely to wait for a better career, economic solvency, and a desire to afford a better future for their children. So that they start their marital life with older age and try to conceive earlier. Similar results showed that women with secondary and higher education are more likely to conceive earlier than the women who have primary education [21]. The use of contraception is a dominant factor for affecting fertility pattern of the women. This study confirms that the decision maker for using contraception plays a significant effect on timing of first conception. Women who can take decision about the use of contraception are less likely to conceive than the women who did not take the decision by themselves. A study estimated that there is a negative effect on fertility pattern with decision making autonomy in household which are related with the use of contraception behavior [26].

Age at first marriage is one of the most important factors for determining the timing of first conception in our country. It is found a significant contributor among all the three levels of BMI. Moreover, the findings from this study showed that women from the overweight group with higher spousal age differences had a higher risk of conceiving earlier than the lower spousal age differences. Since spousal age gap

indicates that women have less freedom to make decisions about her fertility behavior. Marital duration is also positively associated with the mean conception wait.

Overall, this results display the timing of first conception depend on the BMI level. As overweight and underweight women have to wait more than the normal weight women. So, it is essential to raise awareness in order to reduce the rate of both underweight and overweight, which are responsible for prolonged conception wait.

## 5. Conclusions

Bangladesh has made significant progress in health over the past decade. Maternal health provides a good understanding of the key elements needed to reduce maternal mortality, caesarean sections and the ability to deliver a healthy baby. In essence, women's health is an important indicator of the quality of access and effectiveness of the country's health sector. Bangladesh faces both the problem of underweight and overweight among women, which is alarming and considered a double burden. The findings of this study clearly demonstrated that healthy women have faster transition to conceive than the underweight and overweight women. Due to malnourishment, the first conception wait is very longer in our country.

The time of first conception is relatively higher in overweight women than in underweight and normal-weight women. The results of the Cox proportional hazard model show that region, respondent education, husband education, decision maker for using contraception, age at first marriage, spousal age difference, and marital duration are influential factors in the timing of first conception among different categories of BMI. Hence, nutritional status should be improved by addressing various factors to reduce the timing of first conception and have a healthy baby. Different campaigns should be organized at the school level to raise awareness about the importance of maternal health status.

## Limitation

Longitudinal survey data should be used in future research to determine the effect of nutritional status on the waiting time to first conception from date of the first marriage, considering the information of the menstrual cycle and coital frequency.

## Ethics Approval

The authors used a secondary data which is available in the website <http://dhsprogram.com/data/available-datasets.cfm>. After registration one can easily get access to use the data freely from the website. The Bangladesh Demographic and Health Survey (BDHS) data was permitted by both the Bangladeshi Ethics Committee and the Ethics Committee of the ICF Macro in Calverton, New York, USA.

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