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Decomposition of the Change in Proximate Determinants and Its Impacts on Fertility in Bangladesh: An Evidence from National Surveys

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Abstract

Bangladesh is passing the second phase of fertility transition according to the study released World Population Prospects (WPP) in 2015. The current aggregate fertility level (TFR) of Bangladesh is 2.3 births per woman. The analysis is based on secondary data obtained from three Bangladesh Demographic Health Surveys (BDHS 1993-94, BDHS 2004 and BDHS 2014). This study critically examined the decomposition of the change in fertility in Bangladesh by proximate determinants during the period 1993-94 to 2014. Due to the direct effect between fertility and proximate determinants, Bongaarts aggregate fertility model was applied. The contribution of each of the major proximate variables has been examined through the decomposition of TFR for the period 1993-94 to 2014 at two points in time. The results indicate that in 2014, contraception has the highest fertility reducing effect accounting for 61.6 percent reduction of TN relative to TMFR for Bangladesh compared to 56.7 percent in 2004. From findings of the study indicate that contraceptive practice is playing the key role in fertility decline in Bangladesh. The analyses also reveal that although the fertility, reducing effect is offset by the declining trend in the lactational infecundability period. The result of the study observed that the policy implications that can be drawn in order to achieve further fertility decline are campaigning for increase in the age at marriage of women and encouraging efforts to increase the quality of contraceptive use which will helped to achieved national and International targeted (SDG 3).

Keywords

Background Determinants, Non-proximate Determinants, Behavioral Factors, Ever Had Terminated in Pregnancy, Postpartum Insusceptibility, SDG, MDG, Induced Abortion

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1. Introduction

Fertility is the most important component of population changes that decide the size, structure, and composition of populations in any country of the world [33]. According to the results of the 2015 Revision of World Population Prospects (UN), total fertility rate is now 2.5 children per woman globally [39].

The 2014 Bangladesh Demographic and Health Survey (BDHS) revealed that the total fertility rate (TFR) has decreased from a high level of 6.3 to 2.3 births per woman during the period 1975 to 2014 [33]. During the period contraception increased by eightfold from 7.7% to 62.4% [33]. The negative association between contraception and total fertility rate (TFR), a rise of nine percentage points in CPR should be accompanied by the fall of 0.66 in the TFR [33].

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Contraception has the highest fertility reducing factor than other factors affect in Bangladesh [22]. The present decline in fertility has created much interest among researchers, policy makers, and academics [2]. The fertility decline was achieved mainly dint of increasing use effective contraceptive method in Bangladesh [12-13, 19]. Increasing delay marriage was decreasing fertility in Bangladesh and its effect was offset by the declining trend in the lactational infecundability period [22]. Approximately 96 percent of the variation in the total fertility rates of 41 developing countries include in Bangladesh could be explained by the four principal prominent determinants of fertility: namely, marriage, contraception, induced abortion and postpartum infecundability was identified by [9]. Fertility transition is not only depending on proximate determinants but also socio-demographic factors contribute indirectly through fertility by proximate determinants [6, 8-9]. Thus the proximate determinants of fertility are the biological and behavioral factors through which the background determinants (social, economic, and environmental variables) affect fertility. The distinguishing feature of a proximate determinant is its direct connection with fertility [9]. This is not necessarily true for a background determinant of fertility such as income, education, religion, residence, exposed mass media etc. Rather than, the socioeconomic (Non-proximate) determinants affect fertility indirectly through their impact on proximate variables [6, 8]. The fertility differentials in Nepal were occurred due to the effect of demographic, socioeconomic, and cultural factors [1].

According to the recent Bangladesh MDG Report (2015), the country wants to be an 'early starter' in the implementation process of the SDGs. Population trends are not explicitly mentioned in the SDGs, but several of the SDGs are directly or indirectly related to future demographic trends. Like many other goals, SDG3 and SDG4. SDG3 (“Ensure healthy lives and promote well- being for all at all ages”) consists of some very specific and some general targets. Target 3.7 states “By 2030, ensure universal access to sexual and reproductive health –care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes [40].

The aim of the study is to quantify inhibiting the effect of the major proximate determinants we applied [9] model to nationally representative data in Bangladesh (we conducted in 1993-94 BDHS, 2004 BDHS and 2014 BDHS). Due to the processing of fertility transition, the contribution of each of the major proximate indices has been examined through of the decomposition of the TFR for the period 1993-94 to 2004 and 2004 to 2014 BDHS respectively.

2. Data and Methods

2.1. Data Sources

The analysis is based on secondary data obtained from the 1993-94, 2004 and 2014 Bangladesh Demographic and Health Surveys (BDHSs). The samples for 1993-94 to 2014 BDHS were nationally representative and cover the entire population residing in noninstitutional dwelling units in the country. The survey used the best sampling frame from the list of enumeration areas (EAs) from 1991, 2001 and 2011 Population & Housing Census of the people’s republic of Bangladesh, provided by Bangladesh Bureau of Statistics (BBS). The Bangladesh Demographic and Health Surveys (BDHSs) were covered 9,681, 10811 and 17989 residential households from 1993-94, 2004 and 2014 respectively. From these sampled household 9640, 11440 and 17886 ever-married women were interviewed respectively.

In this study, data are restricted to ever-married women aged 15-49. Based on these criteria, sample sizes for this study from the seven BDHS were 9495 ever-married women in 1993-94, 11290 ever-married women in 2004 and 17863 ever-married women in 2014. Data were weighted to represent the structure of the Bangladeshi population using weighting factors provided with the BDHS.

2.2. Estimation of Proximate Determinant Indices

Using 41 developing countries data [9] demonstrated that 96 percent of the variation of fertility level is explained by the four principal proximate determinants of regulated fertility viz. the proportion of females married, the prevalence of contraceptive use, the incidence of induced abortion and the fertility inhibiting effect breastfeeding. In such a hypothetical situation the value of varies between 13 and 17 but, the mean value of 15.3 births has been suggested by Bongaarts. The index was ranged from 0 to 1. Fertility will static dint of proximate variables if index sharp to 1, whereas fertility will reduce when index is close to 0.

According to the model:

$$TFR=Cm \times Cc \times Ca \times Ci \times TF \quad (1)$$

where

Cm=index of marriage (equals 1 if all woman of 15-49 years old are married and 0 in the absence of marriage)

Cc=index of contraception (equals 1 if use no contraception and 0 when all fecund women use completely effective contraception)

Ca=index of abortion (equals 1 when no induced abortion occur and 0 if all pregnancies are aborted)

Ci=index of postpartum infecundability (equals 1 in the absence of lactation and postpartum abstinence and 0 if the duration of infecundability is infinite)

TF=Total Fecundity and TFR=Total fertility rate.

2.2.1. Estimation of Cm

In Bangladesh, sexual intercourse and childbearing generally occur only within marriage. Thus, the variables which determine the formation and dissolution of marital unions are very important in determining fertility. The index Cm is calculated as follows:

$$Cm=\frac{\Sigma m(a)\times g(a)}{\Sigma g(a)}$$

where

m (a)=age-specific proportion currently married among females.

g(a)=age-specific marital fertility rates.

2.2.2. Estimation of Cc

The index of contraception is inversely related to the prevalence and use effectiveness of contraception. In this application the index Cc is calculated by the following formula:

$$Cc=1-1.08\times u\times e$$

where

u=prevalence of current contraceptive use among married women of reproductive age

e =average use-effectiveness of contraception.

Where the average use-effectiveness 'e', is estimated as the weighted average of the method specific use-effectiveness level, e(m), with the weights equal to the proportion of woman using a given method, u(m):

$$e=\frac{\Sigma e(m)u(m)}{\Sigma u(m)}$$

The coefficient 1.08 in this equation is an adjustment factor required because women do not use contraception if they know or believe that they are sterile.

2.2.3. Estimation of Ca

The number of births averted per induced abortion is largely independent of the age of woman, however, is strongly related to the practice of contraception following the induced abortion. In [9] it is defined as:

$$Ca=TFR/\ (TFR+.4\times\ (1+u)\ \times\ TA)$$

Index of abortion is calculated from the information of lifetime experience of induced abortions (TA), contraceptive use (u), and total fertility rate (TFR).

Here abortion rate is calculated by similar manner way of age specific fertility rate, but here denominator is the number of abortions in the last year among pregnant women rather than number live births in the last year. Hence the abortion rate is calculated by the number of induced abortions occurring in a specified reference period (e.g., one year) per 1000 women of reproductive age (15-49).

The abortion rate (AR) is calculated as:

$$AR=\frac{\#\text{ of abortions}\times 1000}{\text{Total mid year population of woman } 15-49}$$

The total abortion rate (TAR) is the total number of abortions a woman will have in her lifetime if current levels persist. This lifetime risk is a cohort measure and can be calculated with period measures (age-specific abortion rates) or approximated by multiplying the abortion rate by the length of the reproductive period (30-35 years) [43]. Thus, the total abortion rate (TAR) is calculated as:

$$TAR=35\times\text{abortion rate}$$

Where 35=# of years of reproductive life span.

2.2.4. Estimation of Ci

"The index of postpartum insusceptibility is intended to describe the effects of breast-feeding or abstinence on fertility in the population". Therefore, the index of postpartum insusceptibility (Ci) is estimated as:

$$Ci=\frac{20}{(18.5+i)}$$

i = mean duration of postpartum infecundability caused by breastfeeding or postpartum abstinence.

Mean duration=$\sum p_i \times w_i$

where p_i is the proportion insusceptible for the first group, and w_i is the time width of the group taken as the difference between the midpoint value of the current group and the preceding group.

2.3. Remaining Proximate Determinants

The remaining proximate determinants, the waiting time to conception, the risk of intrauterine mortality and the onset of permanent sterility, are not separately represented in the model byindexes. Instead, the combined effect of these three factors is measured by the TF. The total fecundity (TF) has been observed to vary from 13 to 17 births per woman [8] with an average of about 15.3 [6]. In this study the TF is also assumed to be 15.3.

2.4. Magnitude of the Fertility Inhibiting Effect Being Accounted for Each Proximate Determinant

The difference between the total fecundity rate (15.3) and the predicted model-estimated TFR demonstrate the resultant inhibitory effect of each determinant while, the fertility controlling effect is prorated by the product of difference between TF and the model TFR to the proportion of the logarithm of each index to the sum of the logarithms of all indices [43].

$$\text{Effect of marriage} = \frac{[\text{TF}-\text{TFR(estimated)}]\times\log_e C_m}{\log_e C_m+\log_e C_c+\log_e C_i+\log_e C_a}$$

$$\text{Effect of contraception} = \frac{[\text{TF}-\text{TFR(estimated)}]\times\log_e C_c}{\log_e C_m+\log_e C_c+\log_e C_i+\log_e C_a}$$

$$\text{Effect of postpartum infecundability} = \frac{[\text{TF}-\text{TFR(estimated)}]\times\log_e C_i}{\log_e C_m+\log_e C_c+\log_e C_i+\log_e C_a}$$

$$\text{Effect of induced abortion} = \frac{[\text{TF}-\text{TFR(estimated)}]\times\log_e C_a}{\log_e C_m+\log_e C_c+\log_e C_i+\log_e C_a}$$

Here, TFR (estimated) = Cm × Cc × Ca × Ci ×15.30

2.5. Decomposition of the Change in Fertility and Contribution of Proximate Variables

In order to quantify the contribution made by each proximate determinant, a decomposition procedure is applied to evaluate the impact of the four principal factors on fertility first between first and recent survey period by economic status for each study countries. The decomposition of the proportional change in the TFR due to changes in different proximate variables) from the indexes Cm, Cc, Ca and I are the interaction factor.

Let 2004 be the Base Year and 2014 be Current Year of the time period for which decomposition is done. Then, with a change in the TFR from $\text{TFR}_{\text{Base year}}$ in the year 2004 to $\text{TFR}_{\text{Current Year}}$ in the year 2014 and with simultaneous changes in the indexes from the

$C_{m_{\text{base year}}}$ To$C_{m_{\text{current year}}}$ from $C_{C\ \text{base year}}$ to$C_{C_{\text{current year}}}$, from $C_{a_{\text{base year}}}$ to $C_{a_{\text{current Year}}}$, from $C_{i_{\text{base year}}}$ to $C_{i_{\text{current Year}}}$ and from $TF_{\text{base year}}$ to $TF_{\text{current year}}$ between the years base and current year, then the ratio $\frac{\text{TFR current year}}{\text{TFR base year}}$ can be expressed as:

$$\frac{\text{TFR current year}}{\text{TFR base year}} = \frac{C_{m_{\text{current year}}}}{C_{m_{\text{base year}}}} \times \frac{C_{C_{\text{current year}}}}{C_{C\ \text{base year}}} \times \frac{C_{a_{\text{current Year}}}}{C_{a_{\text{base year}}}} \times \frac{C_{i_{\text{current Year}}}}{C_{i_{\text{base year}}}} \times \frac{TF_{\text{current year}}}{TF_{\text{base year}}} \quad (2)$$

where $\text{P}_{\text{fertility}} = \frac{\text{TFR current year}}{\text{TFR base year}} - 1$ =Proportional change in TFR between the base and current year. $\text{P}_{\text{marriage}} = \frac{C_{m_{\text{current year}}}}{C_{m_{\text{base year}}}} - 1$ = proportional change in TFR due to a change in the index of marriage between the base and current year.

$\text{P}_{\text{contraception}} = \frac{C_{C_{\text{current year}}}}{C_{C\ \text{base year}}} - 1$= proportional change in TFR due to change in the index of contraception between the base and current year.

$\text{P}_{\text{abortion}} = \frac{C_{a_{\text{current Year}}}}{C_{a_{\text{base year}}}} - 1$ = proportional change in TFR due to change in the index of induced abortion between the base and current year.

$\text{P}_{\text{postpartum infecundability}} = \frac{C_{i_{\text{current Year}}}}{C_{i_{\text{base year}}}} - 1$= proportional change in TFR due to change in the index of postpartum Infecundability between the base and current year.

$\text{P}_{\text{other variables}} = \frac{\text{TF current year}}{\text{TF base year}} - 1$ = proportional change in TFR due to change in the remaining proximate variables natural fecundability, spontaneous intrauterine mortality and permanent sterility

Therefore ∴ $\text{P}_{\text{fertility}} = \text{P}_{\text{marriage}} + \text{P}_{\text{contraception}} + \text{P}_{\text{abortion}} + \text{P}_{\text{postpartum infecundability}} + \text{P}_{\text{other variables}} + \text{I}$

Where I is an interaction factors, which consists of all second and higher order products of P factors. Thus, the proportional change in TFR between 2004 and 2014 is equal to the sum of the proportional fertility changes due to the different proximate determinants plus an interaction term.

3. Results

Fertility Inhibiting Effect of the Major Proximate Determinants

Table 1 represents a necessary measure for the consumption of the indices of Bongaarts model. Hypothetical research reveals that TFR, TMFR (Total marital fertility rate) and TN (Total natural fertility) change broadly among the different population. TF is rather stable and Bongaarts (1983) estimated that it ranges from 13 to 17 births per women, with the study value 15.3. In this study, we also used the value of TF is 15.3. From Table 1 it is observed that TFR (observed) declined by 33.14 percent or from 3.44 births per women in 1993-94 to 2.30 births in 2014. The use of contraceptive method has increased by 17.9 percentage points from 44.7 percent in 2004 to 62.3 percent in 2014. Table 1 also shows that for all the surveys contraceptive use effectiveness increases gradually in Bangladesh. The average use effectiveness increased slowly from 90.2 percent in 1993-94

to 91.5 percent in 2014. The total abortion rate increased from 0.365 in 1993-94 to 0.515 in 2004, declining again to 0.456 in 2014.

The mean duration of postpartum amenorrhea to be 11.65 months of the year 1993-94; which declined into almost 6 months in 2014. Again, we see that the mean duration of postpartum abstaining among Bangladeshi women was estimated 2.86 months for the year 1993-94 which slightly decreased into 2.63 months in 2004 and increased to 3.52 months in 2014. A similar picture emerges when postpartum infecundability (PPI) is considered. The mean duration postpartum insusceptibility has steadily declined by 35.10 percent or from 12.34 months in 1993-94 to 8.01 months in 2014.

Table 1. Estimates of selected reproductive measures of proximate determinants in Bangladesh according to BDHS data.

Reproductive measure	Sources		
	BDHS 1993-94	BDHS 2004	BDHS 2014
TFR (observed)	3.44	3.0	2.30
TMFR (observed)	4.545	4.165	3.22
Proportion of currently using Contraception (u)	0.447	0.580	0.623
Average use effectiveness	0.902	0.905	0.915
Total abortion rate (TAR)	0.365	0.515	0.456
Mean duration of Postpartum amenorrhea (in months)	11.65	8.57	5.99
Mean duration of Postpartum abstaining (in months)	2.86	2.63	3.52
Mean duration of postpartum Infecundability (in months)	12.34	9.46	8.01

N.B: Observed data sources from [33].

The estimates of the indices of the four major proximate determinants of Bangladesh are presented in Table 2. The complement of each index represents the proportionate reduction in fertility attributes to reach fertility. The lower of the index value the greater is the fertility reducing impact. The index Cm represents the proportion by which TFR is smaller than TMFR as a result of the marital pattern. Similarly, the index Cc gives the proportion by which TMFR is smaller that TN (Total Natural Fertility), given the effectiveness of contraceptive use and the index Ci indicated by how much TN is smaller than TF (Total Fecundity) due to the effect of postpartum infecundability.

The result indicates that in 1993-94 contraception had the highest fertility reducing the effect, accounting respectively for 43.4 percent (Cc=0.566) reduction of TN relative to TMFR. Postpartum infecundability emerges as the second most important fertility reducing factor, reducing the TF by 35.1 percent (Ci=0.649). The marriage pattern had the third highest fertility- reducing effect in each period, which reduces the actual fertility level below the marital fertility by 24.4 percent (Cm=0.756). Induced abortion had the lowest fertility-reducing effect in this period. The result from Table 2 also indicates that in 2014, contraception has the highest fertility- reducing effect accounting for 61.6 percent (Cc=0.384) reduction of TN relative to TMFR, for entire Bangladesh compared to 56.7 percent in 2004. Marriage is the second highest fertility reducing factor in 2014, which reduce the actual fertility level below the marital fertility by 29.2 percent (Cm=0.708). Postpartum infecundability is the third most important fertility reducing factor in 2014, reducing the TF rate by 24.6 percent (Ci=0.754) compared to 35.1 percent in 1993-94. Induced abortion is playing a positive role in fertility reduction for the last couple of years. Induced abortion is the fourth most important fertility reducing factor in 2014, reducing the TN by 11.4 percent (Ca=.886) compared to 5.8 percent in 1993-94.

Table 2. Estimated indices for the four major proximate determinants of fertility and their impact on fertility reduction in Bangladesh: 1993-94 to 2014 BDHS.

Indices of proximate determinates	1993-94		2004		2014	
	Value (Est.)	Impact of fertility reduction (%)	Value (Est.)	Impact of fertility reduction (%)	Value (Est.)	Impact of fertility reduction (%)
Index of marriage (Cm)	0.756	24.4	0.726	27.4	0.708	29.2
Index of contraception (Cc)	0.566	43.4	0.433	56.7	0.384	61.6
Index of induced Abortion (Ca)	0.942	5.8	0.902	9.8	0.886	11.4
Index of postpartum Infecundability (Ci)	0.649	35.1	0.715	28.5	0.754	24.6

Table 3 shows the estimated value of four proximate determinants. The value of each index represents the proportionate reduction in fertility, which is attributable to each determinant. During the period 1993-94 to 2004, the index of marriage declined by 3.10 percent only, where as the index of contraception declined by almost 24 percent, but the index of postpartum infecundability increased by 10.2 percent. Again the Table 3 also recommended that induced abortion is playing a positive role in fertility reduction during the period 1993-94 to 2004, the index of induced abortion declined by 4.25 percent in the same period. The combined fertility limiting effect of the four proximate determinants ($Cm \times Cc \times Ca \times Ci$) was 0.263 in 1993-94 and 0.203 in 2004, indicating a declining of about 22.814 percent in

fertility during the period 1993-94 to 2004. Thus the decline in the total fertility (estimated) from 4.02 to 3.10 between 1993-94 and 2004 is caused primarily by reducing the effect of contraception (24 percent).

The changing pattern of indices remains same for the period 2004 to 2014, but their intensities have increased over the period. During the period 2004 to 2014, the index of the marriage pattern declined by 2.50 percent, where as the index of contraception declined 11.32 percent in fertility. The fertility reducing effect of postpartum infecundability increased during this period. Here an index of postpartum infecundability increased by 5.46 percent. The combined fertility limiting effect of the four proximate determinants (Cm ×Cc ×Ca× Ci) was 0.203 in 2004 and 0.182 in 2014, indicating a declining of about 10.345 percent in fertility during the period 2004 to 2014. Thus the decline in the total fertility (estimated) from 3.10 to 2.78 between 2004 and 2014 is caused primarily by reducing the effect of contraception (11.32 percent).

Table 3. Estimate of the indices of four proximate determinants of fertility and their relative change for the selected periods.

Indices of proximate determinates	Period			% of change in TFR	
	1993-94	2004	2014	1993-94 to 2004	2004 to 2014
Cm	0.756	0.726	0.708	-3.969	-2.479
Cc	0.566	0.433	0.384	-23.498	-11.316
Ca	0.942	0.902	0.886	-4.246	-1.774
Ci	0.649	0.715	0.754	10.169	5.455
Combined effect of the above four Proximate determinants (Cm× Cc × Ca × Ci)	0.263	0.203	0.182	-22.814	-10.345
TF	15.3	15.3	15.3	0.0	0.0
TFR (estimated)	4.02	3.10	2.78	-22.886	-10.323

Table 4 exhibits the magnitude of the total fertility controlling effect accounted for by each proximate determinants of fertility for the period 1993-94 to 2014 at three different time points 1993-94, 2004 and 2014. The difference between total fecundity taken as 15.3 and the estimated TFR is attributed to the result of the combined inhibiting effect of all the determinants. The total inhibiting effect is prorated by the proportion of the logarithm of each index to the sum of the logarithms of all indices [44].

Each estimated value of the columns expresses the inhibiting capacity of the corresponding determinant of fertility for that period. The result indicates that out of the 11.28 births in 1993-94 that are inhibited, 2.35 births (or 20.84 percent total inhibiting effects) are due to the effect of marriage variable, 4.79 births (or 42.46%) are due to contraception, 0.5 births (or 4.43%) are due to induced abortion and 3.64 births (or 32.27%) are due to postpartum infecundability. Similarly, in the 2004 BDHS, of a total of almost 12.2 births, marriage pattern inhibited 2.45 (or 20.08%) births, contraception controlled 6.40 births (or 52.46%) birth, abortion 0.79 (or 6.48%) and postpartum infecundability inhibited 2.56 births (or 20.98%). The Table 4 also indicates that, in 2014 the proximate variables (marriage, contraception, abortion and postpartum infecundability) are inhibited 12.52 births, distributed, respectively as 2.53 births (or 20.21%), 7.03 births (or 56.15%), almost 0.90 births (or 7.11%) and almost 2.10 births (or 16.53%).

The inhibiting of proportion married index, which is less continuously increasing from a level of 2.35 births per woman in 1993-94 to 2.53 births per woman in 2014. Again the effect of contraceptive use increased from 4.79 births per woman in 1993-94 to 7.03 births per woman in 2014. In contrast, the effect of postpartum infecundability decreased during the same period from 3.64 to 2.07. Again the effect of induced abortion has slightly increased during the period.

Table 4. Magnitude of the total fertility–inhibiting effect being accounted for each proximate determinants of fertility in Bangladesh: 1993-94 to 2014.

Proximate variable	Fertility inhibiting Effect					
	Births per women			Percentage		
	1993-94	2004	2014	1993-94	2004	2014
Marriage (Cm)	2.35	2.45	2.53	20.84	20.08	20.21
Contraception (Cc)	4.79	6.40	7.03	42.46	52.46	56.15
Induced abortion (Ca)	0.50	0.79	0.89	4.43	6.48	7.11
Postpartum infecundability (Ci)	3.64	2.56	2.07	32.27	20.98	16.53
Total: [15.3-TFR (estimated)]	11.28	12.2	12.52	100.0	100.0	100.0

The Figure 1 shows that the indices of marriage, contraception, abortion and postpartum infecundability contributed to the reduction in TFR of 20.21%, 56.15%, 7.11% and 16.53% in 2014, respectively. The pattern stayed roughly the same in 2004. The Figure 1 revels that contraception plays much more important role in reducing the fertility level than other proximate variables in Bangladesh, as it increased from 42.46% in 1993-94 to 56.15% in 2014; while the index of postpartum infecundability fell down, from 32.27% in 1993-94 to 16.53% in 2014 are due to shortening of postpartum amenorrhea.

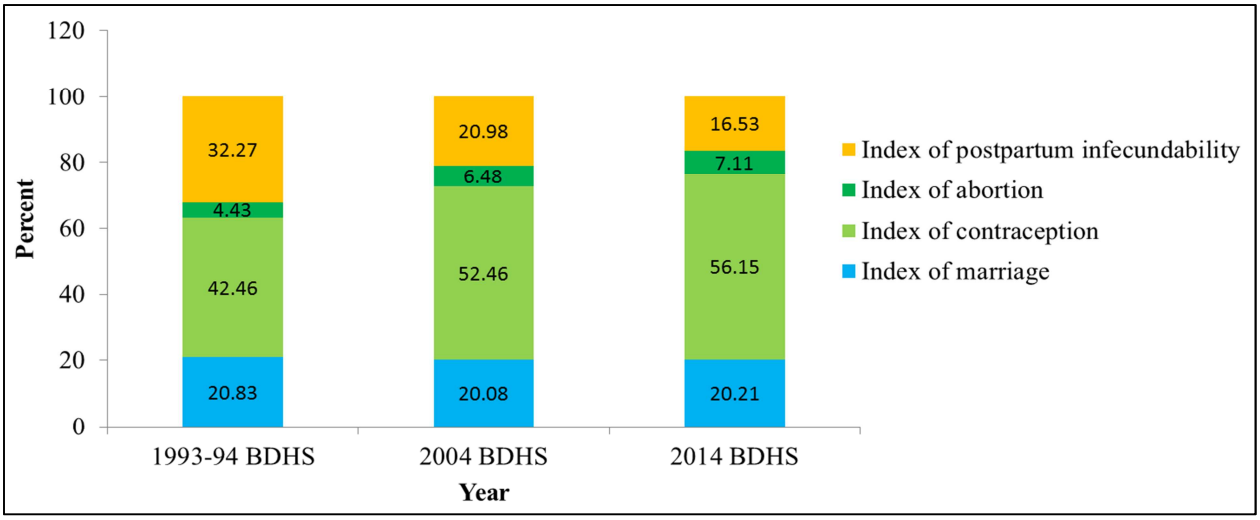

Figure 1. Trend in percentage of birth averted per woman due to marriage, contraception, postpartum infecundability and abortion: Bangladesh 1993-94 to 2014.

Decomposition of the Changes in Total Fertility Rate by Different Indices for the Period 1993-94 to 2014

Table 5 represents that, the values of the decomposition of change by all indices in TFR between 1993-94 to 2004 and 2004 to 2014. The results presented in Table 5 indicate that TFR in Bangladesh declined by 22.89 percent or absolutely 0.92 births from 4.02 births in 1993-94 to 3.10 births in 2004. The decomposition analysis suggests that this decline in fertility has been occurred due to delay marriage, a decline of 3.97 percent (absolutely 0.16 birth per woman), a 23.77 percent (absolutely 0.96 birth per woman) decline due to an increase of contraception practice, a 10.109 percent (absolutely 0.41 birth per woman) increase due to shortening of the duration of postpartum infecundability, a 4.25 percent decline due to an increase in the practice of induced abortion, and a 1.07 percent decline due to increase interaction factor.

Again, during the period 2004 to 2014, These result indicate that TFR decline 10.32 percent or absolutely 0.32 birth from 3.10 birth in 2004 to 2.78 birth in 2014 can be decomposed into a 2.48 percent (absolutely 0.08 birth per woman) decline due to decrease in the proportion of woman married, a 11.32 percent (absolutely 0.35 birth per woman) decline due to an increase in contraceptive practice, a 5.46 percent (absolutely 0.17 birth per woman) increase due to shortening of the duration of postpartum infecundability, a 1.78 percent (absolutely 0.05 birth per woman) decline due to an increase in the practice of induced abortion, and a slightly 0.209 percent decline due to increase interaction factor.

Table 5. Decomposition of the changes in TFR by different indices in Bangladesh: 1993-94 to 2014 BDHS

Changing indices	Percentage of change in TFR		Distribution of % of change in TFR		Absolute change in TFR	
	1993-94 to 2004	2004 to 2014	1993-94 to 2004	2004 to 2014	1993-94 to 2004	2004 to 2014
Proportion of women married	-3.97	-2.48	-17.34	-24.01	-0.16	-0.08
Contraceptive practice	-23.77	-11.32	-103.85	-109.62	-0.96	-0.35
Duration of postpartum infecundability	10.17	5.46	44.43	52.84	0.41	0.17
Induced abortion	-4.25	-1.77	-18.55	-17.18	-0.17	-0.05
Total fecundity rate	0.00	0.00	0.00	0.00	0.000	0.000
Interaction	-1.07	-0.21	-4.69	-2.03	-0.04	-0.006
Total	-22.89	-10.32	-100.0	-100.0	-0.92	-0.32

4. Discussion

Bangladesh is one of the leading countries to decrease fertility in the last few decades. The findings of the study also showed that in 2014, contraception has the highest fertility reducing effect. The national family planning programme has achieved remarkable success in a short period of time; reaching a CPR of 62.4 percent in 2014 it was only 44.6 percent in 1993-94. CPR is increasing around one percentage point annually. From finding of the study observed that the values of other three indices (marriage, contraception and induced abortion) are in the declining trend with the exception of postpartum insusceptibility, which eventually proves fertility decline in Bangladesh.

In this study, we found that the increasing effect of

contraception is evident from the declining trend in the values of the index Cc from 0.566 in 1993-94 to 0.384 in 2014. More specifically, increased time contraceptive practice (due to the lower index value of Cc) has been considered highest fertility inhibiting effect during this survey period. Contraception is the most fertility inhibiting factors when users would like to prefer modern contraceptive methods than traditional methods [27, 45]. In Bangladesh future reduction of fertility will be largely related to the increased use of effective family planning methods [22-23, 25, 27, 35, 37, 45]. Family planning methods targeted at married women may have a huge impact on fertility reduction [15]. Total fertility in Vietnam had fallen dramatically due to high rates of contraceptive use and of induced abortion [18]. Large fertility decline in the developing world occurred due to a major change in reproductive behavior of couples in the childbearing ages [46]. Fertility has declined among both poor and non-poor in Asia region women during ten years and more (except Vietnam) time period due to the changes in increasing proportion of women currently practicing contraception [29].

The decreasing effect of postpartum infecundability is evident from the increasing trend in the values of the index Ci from 0.649 in 1993-94 to 0.754 in 2014. It is clearly indicated that fertility inhibiting effect due to the postpartum infecundability is decreasing trend. In 1993-94, postpartum infecundability emerges as the second most important fertility reducing factor. But in 2014 postpartum infecundability was the second most influential factor—with 16.53% in reducing fertility in Bangladesh. Early 1990s postpartum infecundability was the highest fertility reducing factor than other proximate factors but after 1990 (1993-94) contraception had become most important determinant of fertility and its fertility-inhibiting effect is still in an increasing tendency [22]. Similar findings were observed in several international surveys in elsewhere [29]. However, These results are not consistent to those study was conducted in Ethiopia [17, 41-42], Oman [20], and Malawi [21], Zambia [15] where it was observed that postpartum infecundity had a supreme fertility inhibiting.

The study clearly shows that the marriage pattern had the third highest fertility reducing effect in each period during the same period but last decades, the estimated value for the marriage index reveals that it is the second highest fertility–inhibiting factor in most recent period in Bangladesh. The decreasing estimated values of Cm indicated that gradually the effect of marriage had increased during period of the survey. Previous study was conducted in Bangladesh also found similar result [22, 27, 37, 45]. Similar results were obtained by [20] who found that marriage had the largest fertility reducing effect in Oman. This study result is similar to other studies [29].

Although induced abortion has been emerged as a vital fertility, reducing factor in Bangladesh, but its veritable contribution could not be estimated due to the gap of authentic statistical information from the survey reports. However, several studies and non-government sources, such as private clinic and hospitals records, etc., reveals that a huge of induced abortion are done under the name of menstrual regulation which is obscured owing to legal and social constraints. This supports findings by [24, 29, 37, 45].

5. Conclusions

In Bangladesh, fertility is still high than the replacement levels. Many factors contribute to this phenomenon. Among these factors age at marriage, contraception, abortions are important and strong predictors that effect fertility. Decreasing trend in early marriage is significantly reduces total fertility of women. Despite the legal restrictions against marrying at a young age, early marriage is common in Bangladesh. Therefore, programs should focus on creating awareness of the marriage law and the disadvantages of early marriage and large family. Although induced abortion has been emerged as an indispensible factor in fertility decline in Bangladesh.

Again out of the four proximate determinants, it was the adoption of contraception that contributed most to fertility changes in Bangladesh in a given time frame. Fertility reduction in Bangladesh is largely dependent on increased use of effective contraceptive methods. If unmet need reduces from 12 percent to 7 percent by 2021 then the contraceptive prevalence rate will increase from 62 percent to 80 percent by the same year (Family planning 2020). Achieving the FP2020 goal of enabling 80 percent women and girls to use contraceptives by 2021 is absolutely critical to meeting Sustainable Development Goals 3 and 5, which call for universal access to sexual and reproductive health and rights and gender equality

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Availability of Data and Materials

The secondary datasets BDHS, 1993-94, 2004 and 2014 are freely available in the following website: http://dhsprogram.com/data/available-datasets.cfm

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