Original article

Levels and proximate determinants of fertility in Butajira District, South Central Ethiopia

Wubegzier Mekonnen, Alemayehu Worku

Abstract

Background: Uncontrolled population growth is evidenced mainly because of the high fertility. Improving maternal and child health services in Ethiopia were one of the main aims of the health extension program. The impediment of early marriage was revised in the national family code which claims assessment of fertility situations.

Objectives: This study aimed at measuring levels and fertility inhibition effects of proximate determinants in Butajira district.

Methods: A cross-sectional study was conducted on resident women of reproductive age group recruited from the Butajira Demographic Surveillance System database. A total of 9996 women with different characteristics were thus interviewed.

Results: Total fertility rate was 5.3 children per woman with high urban-rural gradient. The non-marriage (C_m=0.66) had the highest fertility inhibition effect followed by postpartum infecundability (C_i=0.68), contraception (C_c=0.77) and abortion (C_a=0.96). Main differences were observed across residential environment and educational status. Abortion had a paramount significance among in school women (c_a=0.76).

Conclusion: Not being married followed by postpartum infecundability and contraception inhibited high fertility. Abortion significantly reduced fertility among students. Keen awareness about negative consequences of high fertility should be attained. Women ought to be advised to marry late and stay in-school for long years. Extended breast feeding should be maintained for birth spacing. There must be sustained effort to increase contraception use rate. In-school women should be educated on problems of abortions. Youth-friendly contraceptive services must also be made available. [*Ethiop. J. Health Dev* 2011;25(3):184-191]

Introduction

Ethiopia has had documented history of uncontrolled population growth during the past three decades going from 39.9 to 73.9 million people though the growth rate was found to have declined slightly from about 3 percent during the first census in 1984 to 2.6 percent in the latest census in 2007 (1). Total fertility rate (TFR) shrank by only 0.5 children from the 2000 level of 5.9 to the 2005 rate of 5.4 children per woman with more than that in the rural areas compared to urban ones (2, 3). Life expectancy at birth remained low while maternal and childhood mortality rates were still among the highest in the sub-region. Cognizant of these facts the government of Ethiopia started a health extension program having as one of its main aims being provision of maternal and child health service at the household level in 2003. The general achievement level rates obtained in 2008 called for more efforts into the program to sustain it (4, 5). Moreover, impediments related to the empowerment of women and the minimum legal ages for marriage were revised in the new family code of the country (6).

Regional disparities in population growth rates and fertility were observed. Southern Nations, Nationalities and Peoples Region (SNNPR), where the study district of Butajira is located, is one of the regions with the highest population growth and fertility rates of 2.9 percent per annum and 5.6 children per woman, respectively. The share of SNNPR's population in the country's total and its population density had increased between the inter-censusal periods of 1994 and 2007 (1). The migration rate due to population pressure was high in the dense and mainly Guraghe inhabited Butajira District (7). The district was home to more than 430,949 people (213,649 male and 217,300 female) according to the 2007 Ethiopian census. Epidemiological transition was also observed in the district besides revealing a similar pattern of child and adolescent mortality with the general Ethiopian population (8, 9).

The paramount contribution of fertility to changes in the size and structure of the population in rural Ethiopia and its link to the success of reproductive health programs and policies needs a detailed study. Fertility has been the centerpiece of such programs. The determinants of fertility are mainly categorized as proximate determinants and distal factors (10). Proximate determinants include bio-demographic and behavioral factors which directly affect fertility that include non-marriage, contraception, postpartum infecundability, and induced abortion. On the other hand, distal factors consist of socio-economic variables such as maternal, paternal and household characteristics that influence the proximate determinants in bringing about change in fertility. Thus, distal factors have an indirect impact while proximate determinants have a direct effect in changing levels of fertility. The distal determinants of fertility in Butajira were documented elsewhere (11). Indentifying the fertility inhibition effects of proximate determinants lends a hand to better understand the mechanisms by which fertility changes in a defined community with respect to the prevailing policies and

School of Public Health, College of Health Science, Addis Ababa University

programs. Hence, this article aims at measuring levels and fertility inhibition effects of proximate determinants in Butajira district.

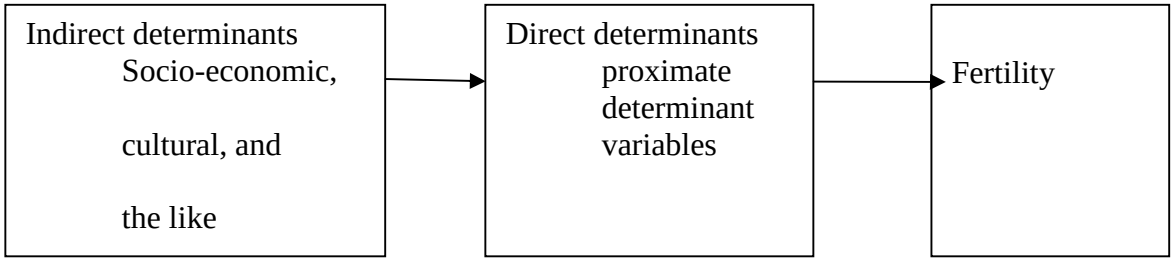
Methods

This study was conducted in the Demographic Surveillance Area (DSA) of the Butajira Demographic Surveillance System (DSS) during October-December 2009. The Butajira DSS was conducted in 10 surveillance villages *(kebeles)* sampled based on probability proportional to size technique from 82 rural and 4 urban *kebeles*. Only one of the 10 sample villages was urban, which is a quarter of Butajira town. The Butajira DSS has been explained in detail elsewhere (12). We used the DSS database to recruit women in reproductive age group as study participants. The database had documented 11,133 women in 2009 though some could not be interviewed because they were absent in three subsequent visits. A total of 9996 women in the reproductive age group (15-49 years) were included in the study.

A standard DHS type maternity history data collection questionnaire was developed in English and translated into the local language and translated back to English by an independent person. The questionnaire was pilot tested in a similar area. Twenty clinical nurses and 5 supervisors with a bachelor degree in different disciplines were recruited as data collectors and supervisors, respectively. The DSS data collection team members were also used as field guides. The field staff was given an intensive training on the principles of data collection and how to use study instruments for three days. The training included lecturing, mock interview and practical sessions in an area other than where the actual study was made.

All field staff members were deployed in one k*ebele* to complete the questionnaire in a short period of time before unwanted rumors about seeking information on abortion collected by this survey started spreading that would increase non-response rate. The same exercise was done in the next closest *kebele* until all of them were finished. Supervisors re-interviewed five percent of study participants besides reviewing each completed questionnaire daily. Every morning, enumerators got feedback about errors they had made on the previous day. Principal investigators were overseeing and organizing the whole exercise in the research. Data were entered into a template prepared on EPI INFO software with CHECK program designed to insure internal consistencies. The data entry clerk was also trained on how to manage inconsistencies. Moreover, investigators checked 50 percent of records entered into the computer daily. The cleaned data were exported to STATA version 11 for analysis.

Total fertility rate was used to measure the magnitude of fertility. Moreover, the Bongaarts' method of measuring the fertility inhibition effect of each proximate determinant was applied (10). Fertility determinants were categorized as indirect (distal) and proximate (direct) factors as shown in the following diagram.



In this model, the total observed fertility rate (TFR) is a function of total fecundity rate (TF), which is the biological maximum number of children a woman can have without any parity specific control, and the four main proximate determinants not being married (being single, separated, divorced or widowed), contraception, postpartum infecundability and induced abortion as shown below.

i. $TFR = TF * C_m * C_c * C_i * C_a$

The indices of proximate determinants of fertility fall between 0 and 1. If the index is closer to 0 the particular proximate determinant under consideration would have a higher fertility inhibiting effect whereas an index close to 1 would have an insignificant inhibiting effect. The index of non-marriage is measured as:

ii. $C_m = \Sigma\, m\,(a) * g\,(a) / \Sigma\, g\,(a)$, where $m\,(a)$ is the age specific proportion of married women and $g\,(a)$ is the age specific marital fertility rate.

The index of contraception is determined as:

iii. $C_c = 1 - 1.18 * u * e$; where u is the average proportion of married women who are currently using family planning methods; e is the average contraceptive effectiveness; and 1.18 is the sterility correction factor. The average contraception effectiveness of 0.85 was considered for this study as per the recommendation of Bongaarts and an experience in rural Ethiopia (10, 13).

Components of birth intervals include postpartum infecundable sub-interval (which is about 1.5 months without lactation); waiting time to conception, which starts at the first ovulation following birth and ends with

a conception (which is about 7.5 months); time due to intrauterine mortality (which is about 2 months); and the nine months of gestation. The total birth interval can thus add up to 20 months. The difference between the total birth interval and the postpartum infecundability without lactation is 18.5 months. The index of postpartum infecundity is computed as the ratio of the average birth intervals without and with lactation as:

iv. $C_i = 20 / (18.5 + i)$, where i is average duration (in months) of infecundability.

The index of induced abortion is calculated as,

v. $C_a = TFR / (TFR + 0.4 * (1 + u) * TA)$; where TFR is the total observed fertility rate; Bongaarts (10) showed that an induced abortion averts 0.4 births on average; u is the average proportion of married women who are currently on contraception; and TA is the average number of induced abortions per woman at the end of the reproductive period.

Ethical clearance for the study was obtained from the Research and Ethics Committee of the School of Public Health and the Institutional Review Board of College of Health Sciences of Addis Ababa University. Oral consent was also obtained from each study participant.

Results

A total of 9996 women with different socio-economic, environmental and cultural characteristics (see Table 1) were interviewed. Nearly half of them and more than 64 percent of their partners had never attended formal school. About 58 percent of them were not married. More than half of the women belonged to the Meskan ethnic group and three quarters of them were Muslims. More than two-third of them were members of farming households.

About 70 percent of their partners were farmers. The average and median household's annual income were estimated to be 12,526.63 and 5950 Ethiopian Birr (equivalent to 963 and 458 USD at the time of the study) respectively.

About 79.2 percent of the women were below 35 years of age with a mean age of 25.9 (±9.1) years as indicated in Table 2. Over 59 percent of the participants had given birth to children. Over 28 percent had 4 or more children. A little over 5 percent of them had one abortion in the preceding five years. About 81 percent wanted to have a child or more children. About 16 percent of the women in reproductive age group and 25.4 percent of married women used family planning methods. Meanwhile, 90.4 percent of the women and about 43 percent of their partners supported the use of family planning methods. Some 42.5 percent of them mentioned discussions about family planning methods with their partners.

Table 1: **The distribution of study participants by demographic, social, economic, environmental and cultural characteristics in Butajira District, Ethiopia, 2009**

Characteristics (n=9996)	Number (percent)
Women's educational status	
Illiterate	6454 (64.6)
Primary	2964 (29.7)
Secondary	375 (3.8)
Post secondary	203 (2.0)
Marital status	
Single	5476 (57.5)
Married	3707 (37.1)
Separated	179 (1.8)
Divorced	116 (1.2)
Widowed	248 (2.5)
Ethnicity	
Sebatbet, Dobi and Others	1465 (14.7)
Meskan	5071 (50.7)
Mareko	1038 (10.4)
Silti	1773 (17.7)
Other Ethnic groups	649 (6.5)
Religion	
Orthodox Christians	1843 (18.4)
Other Christians	689 (6.9)
Muslims	7464 (74.7)
Partner's occupation	
Farmer	4035 (70.0)
Trader	627 (10.9)
Employees	916 (15.9)
Others	184 (3.2)
Woman's occupation	
Employed	3664 (36.7)
House wife	3040 (30.4)
Student	3292 (32.9)

The analysis showed a total fertility rate of 5.3 children per woman and a marital fertility of 7.8 children per married woman, respectively. Moreover, the highest fertility was documented in rural lowland areas (6.6) while the lowest was observed in Butajira town (3.3). The peak age group of fertility was 25-29 years as shown in Figure 1.

As pointed out earlier the main proximate determinants of fertility include non-marriage, contraception, abortion and postpartum infecundability. The index of non-marriage, which measures the effect of late marriage and marital instability, reduced fertility from its biological maximum by 34 percent. Further analysis of the effect of non-marriage to reduce fertility from its biological maximum showed a decrease of 47 percent among urbanites. On the other hand, fertility went down from its biological maximum by about 59 percent in women with secondary and above level of education. Non-marriage reduced fertility from its natural level by 43 among Orthodox Christians whereas it had registered the fertility inhibition effect of 39 percent among *Guraghes* other than the *Meskan* clan. It had also reduced natural fertility by 74 percent among girls who were by then attending school. The fertility reduction pattern of non-marriage among member women of households in different income quintiles was not clear.

Table 2: **The Distribution of Study Participants by their Reproductive Health Characteristics in Butajira District, Ethiopia, 2009**

Characteristics	Number (Percent)

Age group (n=9996)	
15-19	3284 (32.9)
20-24	1728 (17.3)
25-29	1630 (16.3)
30-34	1274 (12.8)
35-39	1012 (10.1)
40-44	699 (7.0)
45-49	369 (3.7)
Mean (±SD)	25 .9 (±9.1)
Child birth (n=9994)	
Yes	5934 (59.4)
No	4060 (40.6)
Children ever born (n=9996)	
≤ 2	5674 (56.8)
3-4	1522 (15.2)
4<	2800 (28.0)
Abortion in the past 5 years (n=9994)	
Yes	515 (5.2)
No	9479 (94.8)
Want (more) child (n=9994)	
Yes	8083 (80.9)
No	1256 (12.6)
Infertile	589 (5.9)
Don't decide	66 (0.7)
Contraception all women (n=9992)	
Yes	1586 (15.9)
No	8406 (84.1)
Contraception (n=5743) (married women)	
Yes	1456 (25.4)
No	4287 (74.6)
Support family planning (n=9993)	
Yes	9038 (90.4)
No	955 (9.6)
Partner support for family planning (n=9993)	
Yes	4287 (42.9)
No	1946 (19.8)
Have no partner	3760 (37.6)
Discussion with partner on FP (n=9992)	
Yes	4250 (42.5)
No	2164 (21.7)
Have no partner	3578 (35.8)

On the other hand, contraception reduced fertility from the biological maximum by only about 23 percent in the area. A detailed analysis of contraception by various socio-economic characteristics showed that contraception reduced natural fertility by about 43 percent in urban Butajira while the reduction in natural fertility was about 57 percent among women who attended secondary and above level of education. On the other hand, contraception reduced natural fertility by a maximum of 31 percent among Christians of other denominations. Contraception had paramount importance in reducing fertility from its biological maximum among in migrant ethnic groups and *Guraghe*s other than the area majority *Meskan* clan with percentage reduction levels of 33 and 32, respectively. Contraception reduced natural fertility by 42 percent among students whereas the reduction effect was about 47 percent among women married to husbands of secondary plus educational level. The effect of contraception in reducing fertility from its biological maximum increased from 15 to 36 percent as the wealth quintile increased from 1st to 5th quintile.

The overall contribution of abortion to reduce fertility from its natural level was only 4 percent. However, abortion reduced natural fertility by a similar level of 7 percent among urbanites and those who attained secondary plus level of education. Abortion reduced natural fertility by about 6 percent among women who confessed in the Orthodox Christianity. The percentage reduction of natural fertility by abortion varied from 3 to 5 percent in the major ethnic groups. Abortion had the highest fertility inhibition effect of 24 percent among students that were attending formal schools. Nevertheless, the effect of abortion to reduce fertility from its biological maximum was about 5 percent among women married to partners with secondary plus level of education. There was no difference in abortion fertility inhibition effect among women in food insecure and secured households.

The overall postpartum infecundability (PPI) index of 0.68 reduced natural fertility from its biological maximum by about 32 percent. PPI brought down the biological maximum of fertility by about 37 percent in highland rural Butajira while its inhibition effect is only 20% in Butajira town. The fertility reduction effect of PPI decreased from 35 to 14 percent as educational status increased from illiterate to secondary plus. No significant differences in fertility reduction effects of PPI were observed across the various religious groups though the effect was a bit higher among Muslims. PPI had a higher inhibition effect of fertility among the *Silti* with a level of 34%. The effect of PPI to reduce fertility was only 22% among students although it was 32 percent among house makers and employed mothers. The effect of PPI to reduce natural fertility decreased from 36 to 20% as partners' educational status increased from no formal education to secondary plus. PPI had a higher fertility inhibition effect of 35% among women of food in-secured households compared to only 25% among those who belong to food sufficient households. The fertility inhibition effect of PPI decreased from 34 to 26 percent as wealth quintile rose from lowest to highest.

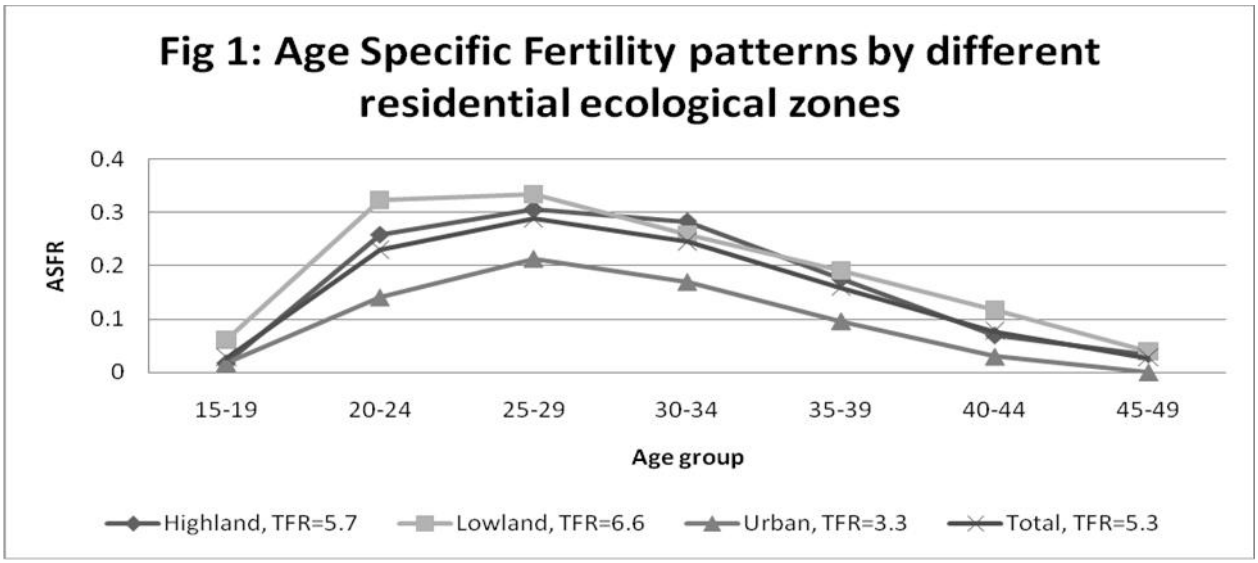


Figure 1: **Age specific fertility patterns by different residential ecological zones**

Table 3: **Indices of the proximate determinants of fertility in Butajira District, Ethiopia, 2009**

Factors	Indices of Proximate Determinants				Observed TFR	Predicted TFR
	C_m	C_c	C_a	C_i		
All women	0.66	0.77	0.96	0.68	5.3	5.1
Ecology						
Highland	0.75	0.85	0.97	0.63	5.7	5.9
Lowland	0.72	0.82	0.96	0.66	6.6	5.7
Urban	0.53	0.57	0.93	0.80	3.3	3.5
Women's education						
Illiterate	0.78	0.82	0.97	0.65	6.3	6.1
Primary	0.61	0.66	0.94	0.75	4.6	4.4
Secondary plus	0.41	0.43	0.93	0.86	2.3	2.2
Religion						
Orthodox	0.57	0.69	0.94	0.71	4.2	4.0
Other Christians	0.63	0.69	0.96	0.71	5.5	4.6
Muslims	0.69	0.79	0.96	0.68	5.5	5.4
Ethnicity						
Other *Guraghes**	0.61	0.68	0.95	0.71	4.9	4.3
Meskan	0.66	0.77	0.96	0.68	5.0	5.1
Mareko	0.72	0.83	0.97	0.68	7.0	6.0
Silti	0.69	0.98	0.96	0.66	7.9	6.6
Others	0.67	0.67	0.96	0.73	4.4	4.8
Occupation						
Employed	0.69	0.76	0.95	0.68	5.1	5.2
House wife	0.92	0.78	0.96	0.68	8.0	7.2
Student	0.23	0.58	0.76	0.78	1.1	1.2
Partner's education						
Illiterate	0.47	0.86	0.96	0.64	4.0	3.8
Primary	0.99	0.74	0.96	0.70	8.1	7.6
Secondary Plus	0.99	0.53	0.94	0.80	5.9	6.1
Household food shortage						
Yes	0.64	0.82	0.96	0.65	5.7	5.0
No	0.67	0.74	0.96	0.75	5.1	5.0
Income quintile						
First	0.73	0.85	0.96	0.66	6.4	5.4
Second	0.63	0.81	0.96	0.66	5.6	4.3
Third	0.65	0.81	0.96	0.66	4.5	4.3
Forth	0.67	0.72	0.96	0.70	5.1	4.0
Fifth	0.64	0.64	0.94	0.74	4.4	3.3

*Other *Guraghes* include *Sebatbet*, *Dobi*, *Sodo* other clans.

Discussion

The high and uncontrolled population growth rate of Ethiopia due to mainly a natural increase as a result of high fertility rate in rural Ethiopia may create a resource gap in the country that may hold back the achievement of the goals set in the national population policy (1, 3, 14). The national health extension program has been implemented in Ethiopia since 2003 with one of the main aims being delivery of maternal and child health services including family planning at the household level though the overall achievement of constructing health posts, certified role model households and deploying health extension workers in Guraghe Zone were 88, 4.7 and 61 percents, respectively in 2008 (4, 5). Moreover current contraceptive prevalence rate among all women in the reproductive age group of 15-49 years and married women were 16 and 25.4 percent, respectively. More than 90 percent of women and about 69 percent of their partners were in support of practicing family planning methods. On the other hand, the family law which has implications on ending and forming marriage and women's rights are being implemented as of 2000 (6). The legal age at first marriage of women, which has a direct impact on fertility, was revised to be 18 years in the new family code. However, the median and mean ages at first marriage of women in reproductive age group in this study were 16 and 16.9 years, respectively.

Total fertility rate was 5.3 children per woman in Butajira District in 2009, which was similar to the level in Gondar in 2007. It was lower by 0.3 children when compared to the SNNPR level in 2005 (3, 15). Fertility was measured in different ways in this study conducted in Butajira DSS and the national Ethiopian Demographic and Health Survey and, therefore, the interpretation of the results should be done cautiously. Fertility level in Butajira District was still one of the highest in the country. This could be due to the large family size norm that requires many children to assist parents in their subsistence farming and to take care of them in old age. On the other hand, the relatively low fertility level in Butajira town might be attributed to the reduction of fertility driven by poverty, rising housing costs and absence of employment opportunities in the urban areas in Ethiopia (16, 17).

Women in Butajira District breastfed their children for more than 20 months and abstained from sex for nearly two months due to cultural reasons. Thus, postpartum infecundability had a significant influence to reduce fertility from its biological maximum by about 32 percent as documented in similar studies in other parts of Ethiopia (15, 18). The contraceptive effect of breast feeding in many developing countries, more than any other method of control, promotes the longer spacing of births although the fertility inhibition effect of marriage was a little higher in this study (19). Any decline in breast feeding must be offset by a comparable increase in the use of contraceptives if increases in fertility are to be prevented, especially in countries such as Ethiopia where breastfeeding is still an important factor. This seemed implausible in the case of Butajira District since contraception prevalence was still low.

Most women in developing countries give birth to children within wedlock with more babies in early marriage and stable unions. Nevertheless, high marital instability was documented in Ethiopia (20) whose fertility effect has been offset by the high re-marriage rate. Marriage as we use it here refers to both legal and consensual unions. The ceiling fertility inhibition effect was documented by non-marriage with a value of 34 percent although PPI had the maximum inhibition effect in similar studies in rural Ethiopia (18, 21). It had also shown variability in effect among different social, economic and cultural characteristics. The fertility inhibition effect of non-marriage was higher among urbanites and those who attained secondary plus level of education with 47 and 59 percent, respectively. In this study, increase in the proportion of singles had reduced fertility below replacement level similar to in Addis Ababa (17). Accordingly, age at first marriage differed from 16.5 years in rural Butajira to 17.8 years among urbanites whereas it was postponed from 16.5 years to 19.7 years when educational status increased from no education to secondary plus. Similar studies in different parts of Ethiopia have also indicated the more significant effect of postponement of age at first marriage in reducing fertility from its biological maximum in urban areas (15, 18, 22).

On the other hand, the fertility inhibiting effect of contraception from its natural level was 23 percent with more effects in urban areas, among educated and Christian mothers whereas it has the lowest effect among the *Silti* (2%). The paramount contribution of contraception to reduce fertility was documented in other urban areas in Ethiopia (17, 22). The majority of the people in the district lived in rural areas where contraception, literacy and accessibility of family planning methods were low. Urbanization and the rise in poverty level among urbanites might have contributed to the increase in contraception and thereby reduced the fertility rates in urban areas as documented in Addis Ababa (16).

Contrary to most studies on fertility determinants in sub-Saharan Africa, measurement of abortion was possible in Butajira District in this study. It was not, however, possible to single out induced abortion in this study since collecting such information in a community, which strongly condemned its occurrence, is sensitive. However, a facility based study indicated a national abortion rate of 23 per 1000 women aged 15-44 years and an abortion ratio of 13 per 100 live births in Ethiopia (23). The study done in a tertiary level referral hospital that managed complications revealed that 93 percent of women treated for abortion complications in SNNPR

were due to induced abortion (23, 24). Prorating the abortion index obtained in this study by the percentage of induced abortions (which is 93 percent) documented in the national facility based abortion study did not change the result significantly. Moreover, abortion, whether it was induced or spontaneous, would have a negative effect on the magnitude of fertility. Besides, detailed analysis showed more than a third of abortions happened to mothers, in school which made us think that most of them were induced abortions as young women did it to remain in school. This is further augmented by the fact that, although the overall effect of abortion to cut off fertility from its natural level was only 4 percent, its maximum fertility inhibition effect (about 24 percent) was documented among students who were currently enrolled in formal schools. Unwanted pregnancies might be common among in-school youth that could end up in having induced abortion since high school students in rural districts including Butajira stay away from their parents that compromise familial control. Moreover, a qualitative study in Nigeria showed that adolescents prefer to undergo early termination of pregnancy rather than using modern contraceptives in fear of their adverse effects on fertility when continuously practiced, while they saw abortion as an immediate solution to an unplanned pregnancy (25).

In conclusion, fertility is still high in the study community with high rural - urban disparity. Postpartum infecundability due to mainly extended breast feeding contributed immensely to reduced fertility from its biological maximum level. The contribution of contraception and non-marriage was also important among urbanites and educated women. Abortion had also played an important role to reduce fertility among in school youth.

An intensive awareness program should be done about the negative consequences of large population caused by high fertility for households, communities and the society at large. Women should also be advised and encouraged to sustain extended breastfeeding. Moreover, longer years of women's education should be scaled up to postpone child birth to later ages to ultimately reduce fertility. Efforts should also be exerted to increase contraception in rural communities and among the school youth. Besides, students should be made aware of the post abortion complications and youth-friendly family planning services.

Acknowledgements

Our deepest gratitude goes to the Bill and Melinda Gates Institute for funding this study. We also thank Dr Assefa Hailemariam who commented on the earlier version of this article. We are very grateful for the study participants who had shared their valuable times. The contribution of the data collection staff and data entry clerk should also be acknowledged.

References

1. CSA. Summary and Statistical Report of the 2007 Population and Housing Census Addis Ababa, Ethiopia: Federal Democratic Republic of Ethiopia Population Census Commission; 2008.
2. CSA & ORC-Macro. Ethiopia Demographic and Health Survey 2000: Central Statistical Authority, Addis Ababa, Ethiopia; ORC Macro, Calverton, USA; 2001.
3. CSA & ORC-Macro. Ethiopia Demographic and Health Survey 2005: Central Statistical Authority, Addis Ababa, Ethiopia; ORC Macro, Calverton, USA; 2006.
4. Argaw H. The Health Extension Program (HEP) of Ethiopia: Summary of Concepts, Progress, Acheivement and Challehnge. Addis Ababa: WHO Ethiopia Country Office, 2007.
5. Bekele A, Kefale M, Tadesse M. Preliminary assessment of the implementation of the health services extension Program: The case of Southern Ethiopia. *Ethiop J Health Dev* 2008;22(3):302-5.
6. FDRE. The Revised Family Code. In: Ethiopia FNGotFDRo, editor. Addis Ababa; 2000.
7. Byass P, Berhane Y, Emmelin A, Wall S. Patterns of local migration and their consequences in a rural Ethiopian population. *Scand J Public Health* 2003;31(1):58-62.
8. Berhane Y, Wall S, Fantahun M, Emmelin A, Mekonnen W, Hogberg U, et al. A rural Ethiopian population undergoing epidemiological transition over a generation: Butajira from 1987 to 2004. *Scand J Public Health* 2008 Jun;36(4):436-41.
9. Byass P, Worku A, Emmelin A, Berhane Y. DSS and DHS: longitudinal and cross-sectional viewpoints on child and adolescent mortality in Ethiopia. *Population Health Metr* 2007;5(12).
10. Bongaarts J. A Framework for analyzing the proximate determinants of fertility. *Population and Development Review* 1978;4(1):105 - 32.
11. Mekonnen W, Worku A. Determinants of fertility in rural Ethiopia: the case of Butajira Demographic Surveillance System (DSS). *BMC Public Health* 2011; 11: p.782
12. Shamebo D, Sandstrom A, Wall S. The Butajira rural health project in Ethiopia: Epidemiological surveillance for research and intervention in primary health care. *Scand J Prim Health Care* 1992 Sep;10(3):198-205.
13. Degu G, Worku A. Differentials of fertility in North and South Gondar zones, northwest Ethiopia: a comparative cross-sectional study. *BMC Public Health* 2008;8:397.
14. Transitional Government of Ethiopia. The National Population Policy of Ethiopia. Addis Ababa, Ethiopia; 1993.
15. Degu G, Worku A. Estimation of the total fertility rates and proximate determinants of fertility in North and South Gondar zones, Northwest Ethiopia: An application of the Bongaarts' model. *Ethiop J Health Dev* 2009;23(1):19 - 27.

16. Gurmu E, Mace R. Fertility decline driven by poverty: The case of Addis Ababa, Ethiopia. *J Biosoc Sci* 2008;40(3):339-58.
17. Sibanda A, Woubalem Z, Hogan DP, Lindstrom DP. The proximate determinants of the decline to below-replacement fertility in Addis Ababa, Ethiopia. *Stud Fam Plann* 2003;34(1):1-7.
18. Proximate Determinants of Fertility in Oromia region, Ethiopia: An application of the Bongaarts Model. : Poulation Studies and Training Cemter, Brown University, USA. Demographic Training and Research Center, AAU, Addis Ababa. Department of Population and Family Health, Jimma University, Jimma; 2003.
19. Breast-feeding and fertility regulation: Current knowledge and programme ploicy implications. *Bulletin of the WHO* 1983;61(3):371-82.
20. Tilson D, Larsen U. Divorce in Ethiopia: The impact of early marriage and childlessness. *J biosoc Sci* 2000;32:355-72.
21. Degu G, Worku A. Examining perceptions of rapid population growth in North and South Gondar zones, northwest Ethiopia. *J Health Popul Nutr* 2009;27(6):784-93.
22. Gebremedhin S, Betre M. Level and differentials of fertility in Awassa town, Southern Ethiopia. *Afr J Reprod Health* 2009;13(1):93-112.
23. Singh S, Fetters T, Gebreselassie H, Abdella A, Gebrehiwot Y, Kumbi S, et al. The Estimated Incidence of Induced Abortion in Ethiopia, 2008. *International Perspectives on Sexual and Reproductive Health* 2010;36(1):16-25.
24. Gebreselassie H, Fetters T, Singh S, Abdella A, Gebrehiwot Y, Tesfaye S, et al. Caring for women with abortion complications in Ethiopia: National estimates and future implications. *Perspectives on Sexual and Reproductive Health* 2010;36(1):6-15.
25. Otoide VO, Oronsaye F, Okonofua FE. Why Nigerian adolescents seek abortion rather than contraception: Evidence from focus-group discussions. *International Family Planning Perspectives* 2001;27(2):77-81.