

## REVIEW

# REASONS FOR PERSISTENTLY HIGH MATERNAL AND PERINATAL MORTALITIES IN ETHIOPIA: PART II-SOCIO-ECONOMIC AND CULTURAL FACTORS

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### ABSTRACT

**BACKGROUND:** The major causes of maternal and perinatal deaths are mostly pregnancy related. However, there are several predisposing factors for the increased risk of pregnancy related complications and deaths in developing countries. The objective of this review was to grossly estimate the effect of selected socioeconomic and cultural factors on maternal mortality, stillbirths and neonatal mortality in Ethiopia.

**METHODS:** A comprehensive literature review was conducted focusing on the effect of total fertility rate (TFR), modern contraceptive use, harmful traditional practice, adult literacy rate and level of income on maternal and perinatal mortalities. For the majority of the data, regression analysis and Pearson correlation coefficient were used as a proxy indicator for the association of variables with maternal, fetal and neonatal mortality.

**RESULTS:** Although there were variations in the methods for estimation, the TFR of women in Ethiopia declined from 5.9 to 4.8 in the last fifteen years, which was in the middle as compared with that of other African countries. The preference of injectable contraceptive method has increased by 7-fold, but the unmet contraceptive need was among the highest in Africa. About 50% reduction in female genital cutting (FGC) was reported although some women's attitude was positive towards the practice of FGC. The regression analysis demonstrated increased risk of stillbirths, neonatal and maternal mortality with increased TFR. The increased adult literacy rate was associated with increased antenatal care and skilled person attended delivery. Low adult literacy was also found to have a negative association with stillbirths and neonatal and maternal mortality. A similar trend was also observed with income.

**CONCLUSION:** Maternal mortality ratio, stillbirth rate and neonatal mortality rate had inverse relations with income and adult education. In Ethiopia, the high total fertility rate, low utilization of contraceptive methods, low adult literacy rate, low income and prevalent harmful traditional practices have probably contributed to the high maternal mortality ratio, stillbirth and neonatal mortality rates.

**KEYWORDS:** adult education, contraception, fertility rate, traditional practice, income, maternal mortality, neonatal mortality, stillbirth

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### INTRODUCTION

The most devastating adverse outcomes of pregnancy complications include maternal deaths, stillbirths, early neonatal deaths, and obstetric fistulae. Globally, over 500,000 maternal deaths and more than 7 million stillbirths and neonatal

deaths occur each year (1-4). Out of the total neonatal deaths, 75% die in their first week of life, and again 75% of these die in the first 24 hours of birth. The maternal mortality ratio (MMR) ranges from 24 per 100,000 births in European countries to above 600 per 100,000 live births in some Sub Saharan African countries. Similarly, the rates of

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stillbirth range from 3 to 4 per 1000 births in the developed countries while it is as high as 100 per 1000 births in some remote areas of the developing world. Several reports have shown that more than 99% of maternal and neonatal deaths occur in low and middle-income countries (the population of Sub Saharan Africa and South Asia carry a disproportionately large burden), to which delay in health care seeking or delay in intervention are highly attributed (2, 5, 6).

Although the major causes of maternal deaths, stillbirths and early neonatal deaths are usually obstetric in origin (obstructed labor, hypertensive disorders, sepsis, and hemorrhage) (7-9), several factors (including multiparity, short birth intervals, unplanned and unwanted pregnancy, cultural practices, low awareness about pregnancy complications and unaffordable, and inaccessible health services) are likely to contribute to the high maternal and perinatal mortality in low income countries. These factors are also likely to be influenced by the cultural beliefs, educational level and women's decision making capacity in the community where women in the reproductive age are living in.

In this review, although a direct association cannot be drawn, it was planned to grossly assess the effect of selected socioeconomic and cultural factors with regard to maternal mortality, stillbirths and neonatal mortality in Ethiopia.

## METHODS

A comprehensive literature review was conducted focusing on the effect of total fertility rate (TFR), modern contraceptive use, harmful traditional practice, adult literacy rate and level of income on maternal and perinatal mortalities. The data sources for this study were electronic databases of Ethiopian Central Statistics Agency, MEASURE DHS, World Health organization and PUBMED. A comprehensive literature review was conducted for the period of 1995-2011. The focus of this review was on Ethiopian women's total fertility rate, modern contraceptive use, prelacteal newborn feeding, harmful traditional practice (female genital cutting, bloody oropharyngeal procedures on infants, marriage by abduction),

country's adult literacy rate and level of income. For the purpose of comparison, total fertility rate, contraceptive unmet need, adult literacy rate and level of income of other selected African countries were included.

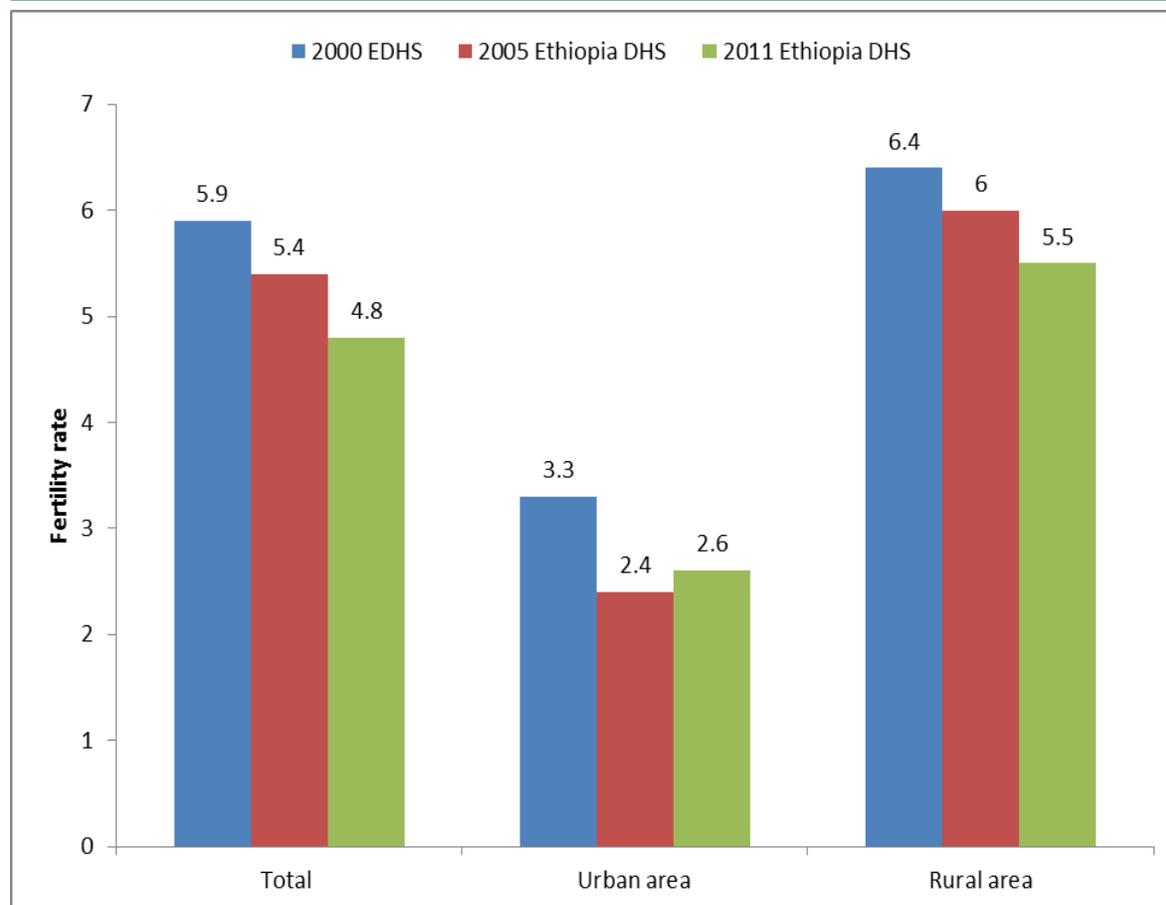
Data were presented in bar graphs and Whisker and Box plot. The total fertility rate, the unmet contraceptive need and adult literacy rate of Ethiopia were compared with other African countries. Bivariate Pearson correlation coefficients and regression lines were generated for maternal mortality ratio, stillbirth and neonatal mortality rates in relation to the total fertility rate and adult literacy rate of some African countries. Additional regression analysis was generated for neonatal mortality in relation with prelacteal feeds. One meta-analysis was done using only data from Ethiopia.

## RESULTS AND DISCUSSION

### Total fertility rate

Total fertility rate (the number of children a woman between ages 15-49 would have during her lifetime) is one of the measures of fertility, and it includes wanted total fertility rate and unwanted total fertility rate. The total fertility rate (TFR) of Ethiopia remained in the high range because of partly socio-cultural norms, male dominance and low status of women (10), and partly because of low supply of the preferred contraceptive methods like the other developing countries (11, 12).

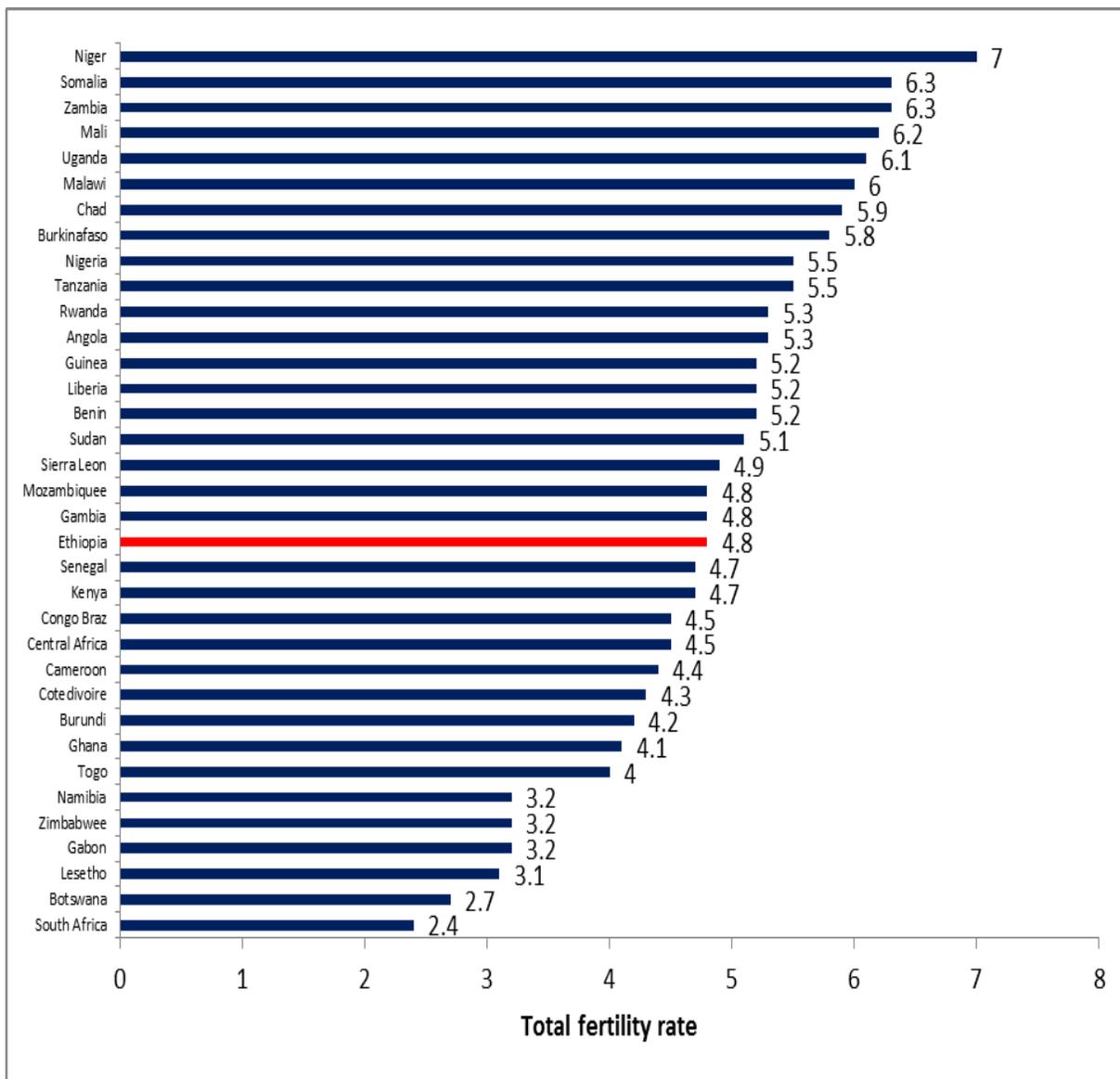
Ethiopian demographic and health surveys (EDHS) have shown that the TFR of women for the nation was about 5.9 in 1995-2000, 5.4 in 2002-2005 and 4.8 in 2006-2011 (13-15). In the last decade, the TFR of rural women was more than 2-fold of the urban women (Figure 1). According to EDHS 2011, the lowest (1.5) and highest (7.1) TFRs were reported from Addis Ababa and Somali region, respectively. The TFR among women with no education and educated to secondary and above was 5.8 and 1.3, respectively. The USAID report for the nation (by referring United States Census Bureau database) (16), however, has shown that the TFR estimated for Ethiopia for the year 2009 was 6.1.



**Figure 1:** Fertility rates for the five years preceding the survey of 2000 EDHS and three years preceding the surveys of 2005 and 2011 EDHSs

As the review from DHS and WHO data showed (Figure 2), the TFRs of several Sub Saharan African (SSA) countries were in the higher range (17, 18). When the TFR of Ethiopian women is compared with that of other 34 selected SSA countries, it was in the middle (4.8 children). In

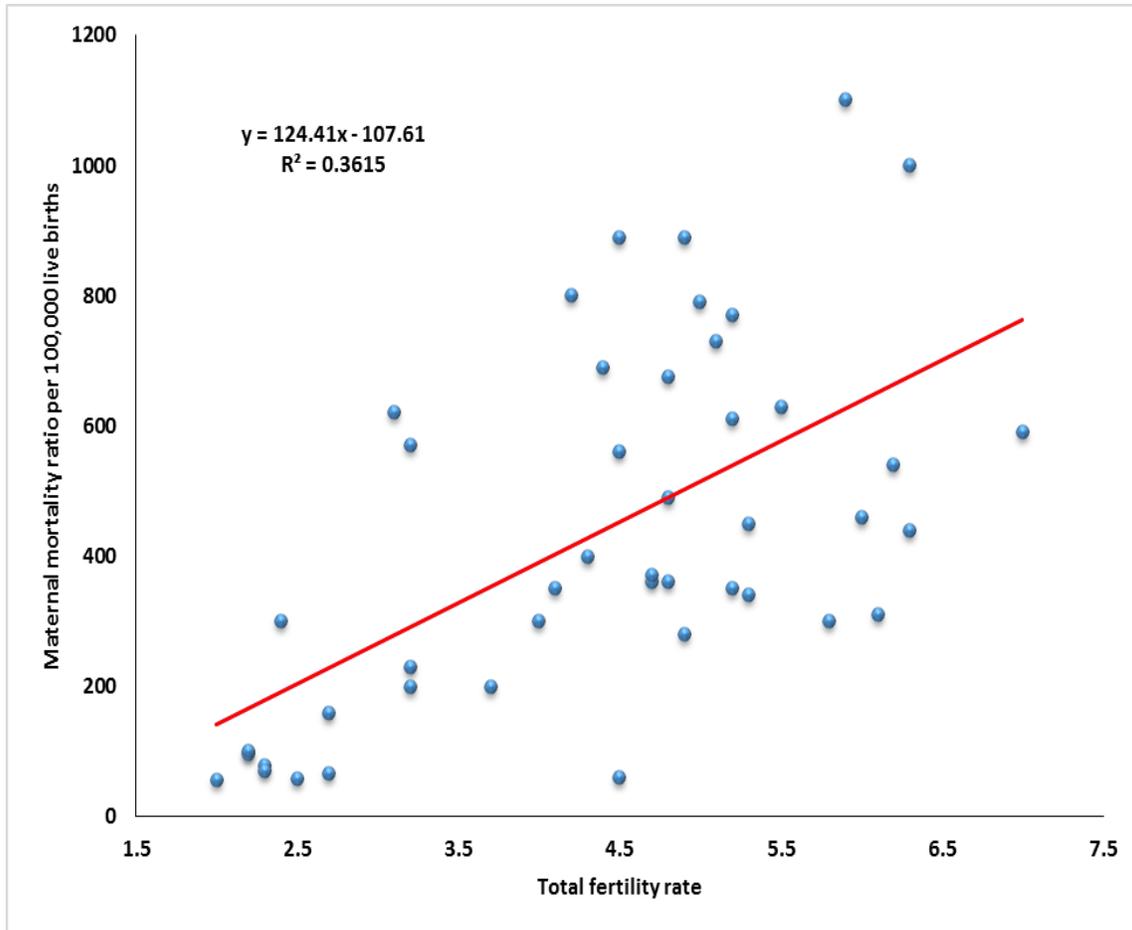
short, in Ethiopia, there has been an ongoing progress in fertility decline over the last two decades particularly in the urban and among educated women. According to Index Mundi estimation, the TFR of Ethiopia has declined from 7.08 in 1990 to 4.05 in 2011 (19).



**Figure 2:** Total fertility rate per woman in 34 Sub Saharan African countries

The high TFR among the rural and uneducated women might have contributed to the increased risk of maternal and perinatal mortality in this group of women as the national surveys have already demonstrated (13-15). Another article has also shown a high proportion of maternal and perinatal mortality among rural and uneducated women, specifically in Ethiopia and some other SSA countries (20). Furthermore, as shown in Figure 3, the Pearson correlation coefficient ( $r$ ) has demonstrated a positive and strong association

of maternal mortality ratio (MMR) with the TFR in 45 African countries ( $r = 0.6$ ;  $P < 0.0001$ ). A similar trend was observed in stillbirth rate and neonatal mortality rate (Figure 4). As the regression lines showed, it seems that every increased birth has been associated with increased risk of maternal and perinatal deaths. However, it should be noted that there are several socio-demographic and obstetric factors that could determine maternal and perinatal outcome (20-24).

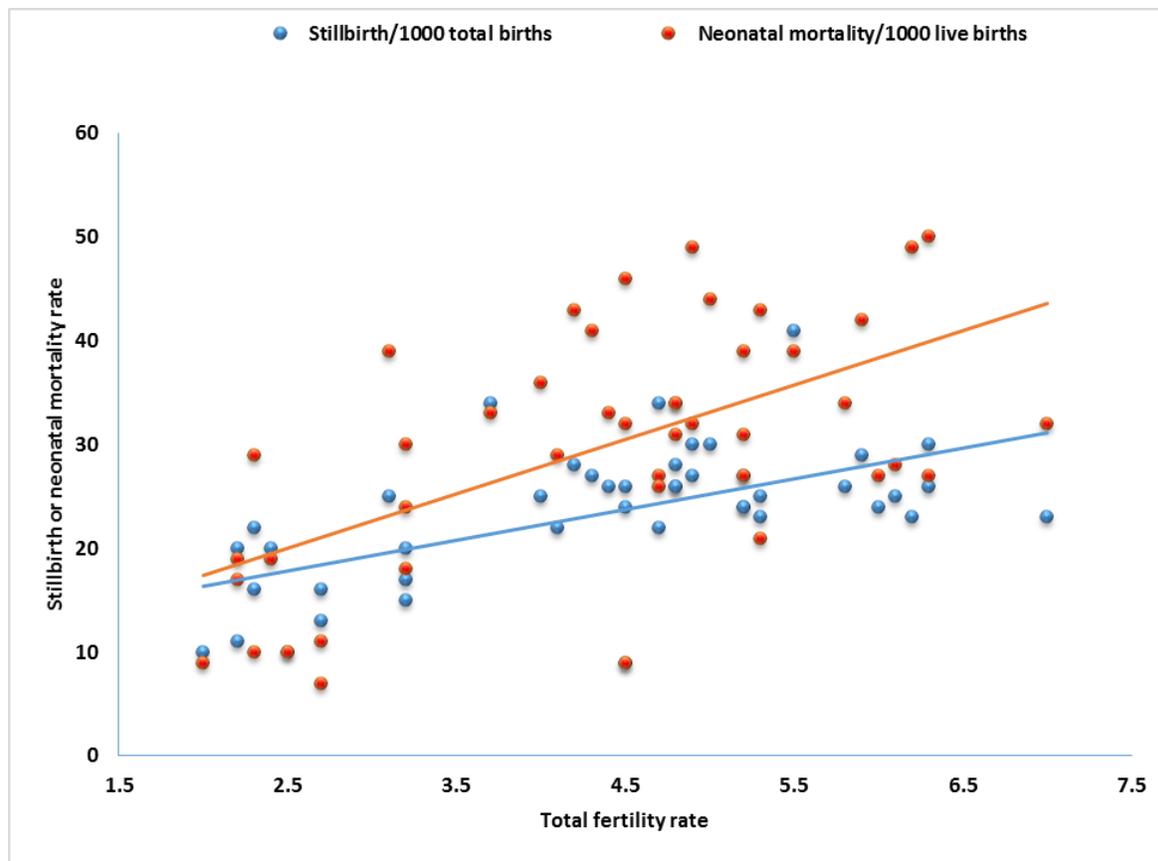


**Figure 3:** Linear regression analysis of total fertility rate with maternal mortality ratio in 45 African countries,  $r = 0.6$ ;  $P < 0.0001$

It was also noted that although the overall correlation of total fertility with MMR, stillbirth and neonatal mortality rate demonstrated an upward trend, there were some African countries with relatively low MMR while the total fertility rates were high (Uganda, Burkinafaso). There were also few African countries with low TFR but with high MMR (Lesotho, Zimbabwe) (Figure 4).

In summary, African countries with high TFR had also high MMR, stillbirth rate and neonatal

mortality rate. The TFR in Ethiopia was among the highest in SSA countries. There was a strong and positive correlation of total fertility rate with MMR, stillbirth rate and neonatal mortality rate. The Institute for Health Metrics and Evaluation 1980-2008 report for 175 countries concluded that maternal mortality falls as fertility rates fall and education levels and incomes rise (25).



**Figure 4:** Linear regression analysis of total fertility rate with stillbirth and neonatal mortality in 45 African countries;  $r = 0.5$ ;  $P < 0.0001$  (stillbirth);  $r = 0.6$ ;  $P < 0.0001$  (neonatal mortality)

#### Utilization of contraceptive methods

The problem of high TFR and low contraceptive use is one side of a coin and remained unresolved in Ethiopia and several SSA countries. Historically, the family planning service was initiated in Ethiopia in 1966 by the Family Guidance Association of Ethiopia (FGAE). Later on, the government of Ethiopia integrated family planning services to maternal and child health service in 1975. In 1993, the national population policy proclamation was launched with the primary objective of balancing the population and economic growth. Thereafter, several nongovernmental organizations (NGO) and charity based health facilities have been providing family planning services.

As a result, as the EDHS 2000, 2005 and 2011 data showed, the contraceptive knowledge of the public was very high, but the contraceptive use was very low and the unmet need for contraception was very high (13-15). According to

the 2011 EDHS report, the knowledge of married women about contraception and the current use of contraception were 98% and 29%, respectively (15). Moreover, five cross-sectional studies conducted in Ethiopia (10, 26-29) have also shown that the majority of women who were in their reproductive age had the awareness about contraceptive methods. Other studies also showed the relatively high knowledge and low utilization of contraceptive methods in Ethiopia (30, 31).

On the other hand, as shown in Figure 5, the unmet need for contraception among currently married women for family planning was among the highest in Africa (8, 9). The unmet need for contraception in Ethiopia was 36% in the late 1995-2000 and 25% in the 2006-2011 (13, 15). In general, family planning is used as one of the strategies to reduce the risk of maternal and perinatal mortality (10, 12, 32).

Among the low income countries, in Bangladesh, it was possible to reduce the TFR to 2-3 by increasing the modern contraceptive use of

married women to 56% (33). The TFR and unmet need for contraception of the high income countries were reported to be about 1.8 and 6, respectively, which might have contributed to their MMR to be about 14 per 100,000 live births, stillbirth and neonatal mortality rates to be each 3 per 1000 live births (18). The cumulative effect of increasing contraceptive use prevalence and reducing the TFR is reducing the risk of maternal and perinatal mortality.

### **Harmful traditional practices**

Apart from the health service and economic factors, maternal and perinatal deaths may be linked with several social, cultural and religious factors. For instance, some harmful traditional practices like female genital cutting (FGC), tonsillectomy, uvulectomy, milk tooth extraction, marriage by abduction and prelacteal feeding may have a direct or indirect effect on maternal and newborn health.

FGC is a traditional and cultural procedure which has been practiced probably for several centuries in many African and South Asian countries. According to the WHO estimates, in this era about 140 million women and girls globally have been victims of FGC, and each year about 3 million girls are subjected to this harmful traditional practice (34). This harmful traditional practice is also widely practiced in Ethiopia (35). This is despite the fact that FGC is labeled as a human rights violation, and is condemned because of its immediate and long term complications to the victim (34).

FGC increases the risk of maternal and perinatal mortality by increasing the risk of postpartum hemorrhage, operative delivery and obstructed labor (34). The severity of maternal and fetal complication is associated with the degree of genital cutting or mutilation. In the Northern part of Ethiopia, this procedure is usually performed in the first week of the female infant life (14, 35). As a result, the risk of significant bleeding, localized and pelvic infection or abscess formation, sepsis and urinary retention may be inevitable, and in some even death due to hemorrhage, sepsis or tetanus may occur (36, 37). Another literature review has also shown that the perinatal death rates were higher for those born to mothers who had undergone genital mutilation compared to those who had not and the risk of death increased

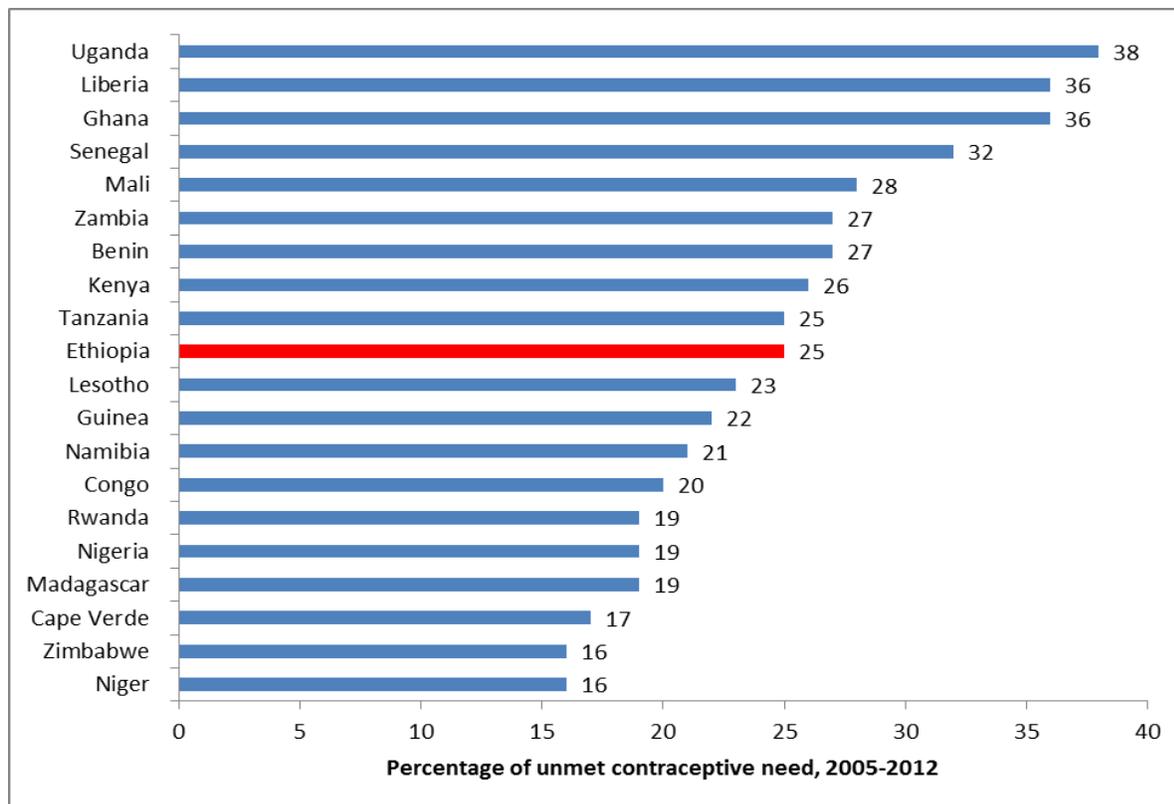
with more genital tissue mutilation: 15% higher for those whose mothers had Type I, 32% higher for those with Type II and 55% higher for those with Type III genital mutilation (38, 39).

Late complications of FGC include: psychological trauma, sexual disharmony and divorce due to severe dyspareunia, external genitalia scarring and disfigurement, labor abnormality, obstructed labor and uterine rupture, increased risk of cesarean section, perineal tear, postpartum hemorrhage and chronic urinary tract infection. It was also well noted that the risk of late complications increased with the severity of the procedure (37-39).

In Ethiopia, previous studies have shown that obstructed labor and uterine rupture were the leading causes of maternal and perinatal mortality (40, 41), and some other complication of obstructed labor (obstetric fistula, disability) are also rampant in this country (42). The authors surmise that the widely practiced FGC in several areas of Ethiopia (14) has probably contributed to the high maternal and perinatal mortality due to obstructed labor and uterine rupture.

As shown in Figure 6, among the Ethiopian women interviewed in 2005, nearly three-fourths (74%) were victims of FGC (14). However, FGC was done in only about 38% of at least one of their daughters, which was a remarkable change. The bad news is that nearly one-third of the interviewed women believe that the practice of FGC should continue. Similar findings were reported from West Africa (39).

As WHO studies showed, the maternal and perinatal complication and mortality risk increases with the severity of the FGC (34). In Ethiopia, particularly in the Eastern Region (Somali = 84%; Somali = 63%; Harari and Diredawa = each 13%) and some zones in the Southern Region (Kembata, Hadya), the type of FGC is usually the major degree type (Type III- external genitalia excision with infibulation) (14). Taking these data into account, we hypothesize that FGC had a role in increasing the risk of maternal and perinatal mortality in Ethiopia in the last three decades by increasing the risk of developing intrapartum complications (obstructed labor, uterine rupture, fetal asphyxia) and postpartum complications (hemorrhage, infection, neonatal sepsis and asphyxia).



**Figure 5:** Unmet need for contraception in 20 Sub-Saharan African countries

The other bloody traditional procedures usually performed during infancy are uvulectomy, tonsillectomy and milk tooth extraction. The percentage of uvulectomy or tonsillectomy performed on the interviewed women and at least on one of their daughters was the same at the national level in the early 2000s (14). And, 29% of the interviewed women believe that this procedure has to continue. According to one multicenter study, about 89% of tonsillectomies and 27% of uvulectomies were performed during the first month of infants' age (35). This shows how risky these procedures were for the immediate survival of the infants and the risk of acquiring HIV/HBV during breastfeeding.

On the other hand, although the recommendation is the infant should not be given anything per os other than the mother's breast milk for the first 6 months after birth (43), the tradition in the majority of Ethiopian family and several other African countries (18) is to initiate the newborn feeding with something other than breast milk. The practice of prelacteal feeds is also quite common in the Arab world among the

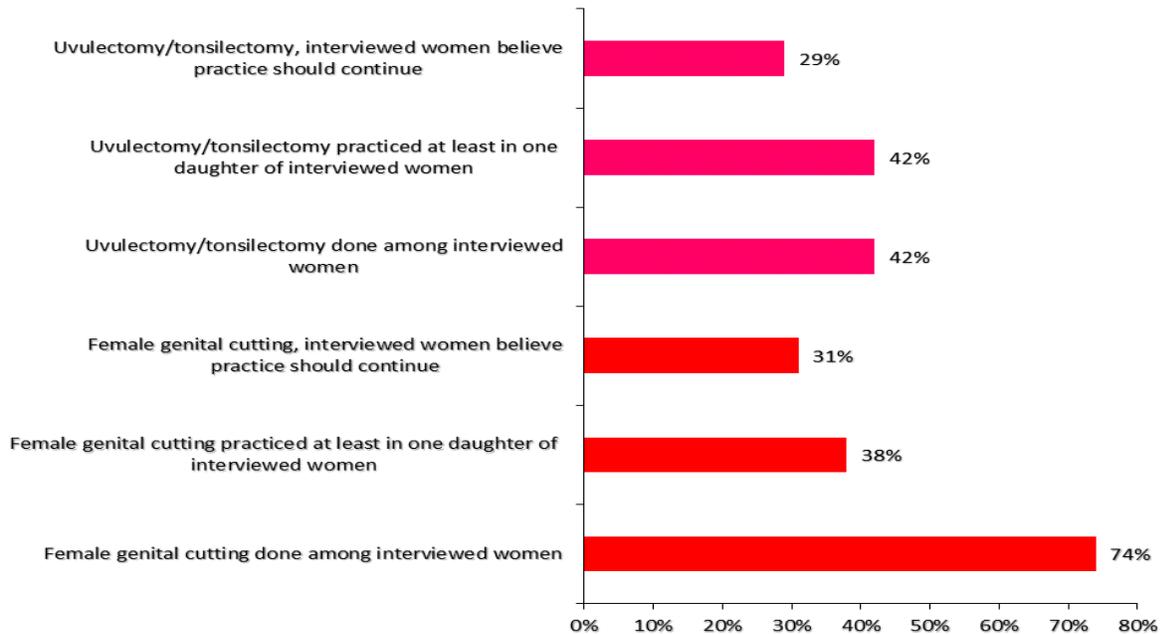
Muslim community and in India among the Hindu family (44, 45).

Specific to Ethiopia, what is first given to the newborn varies from place to place. As an unpublished study showed, the commonly used for prelacteal feeding are butter, honey, cow milk, *bullā* (prepared from false banana/ensete leaf), *yebish wuha* (prepared from fenugreek), *hamesa* candy and water (Berhan Y. Prelacteal feeding practice in Sidama Zone/Ethiopia). *Hamesa* is a traditionally prepared soup in the Southern Region of Ethiopia. It is prepared by mixing different types of leaves and tree bark. The reason why they give *hamesa* to the newborn before the breast milk is to prevent a 'deadly hereditary disease'. In some areas, the baby may be given up to one month to 'guarantee its health and strength'. If a newborn dies while taking *hamesa*, it may be considered as if the death occurred for good.

The reason why others give prelacteal feeds also varies from place to place: 1) washing the gastrointestinal tract, 2) to make the baby stronger, 3) delay in breast milk ejection or perceives that breast milk is insufficient, 4) to let the baby taste the sweet and have a sweet life (those giving

honey and date), to let the baby taste the bitter and have the tolerance of any hardship in his/her life,

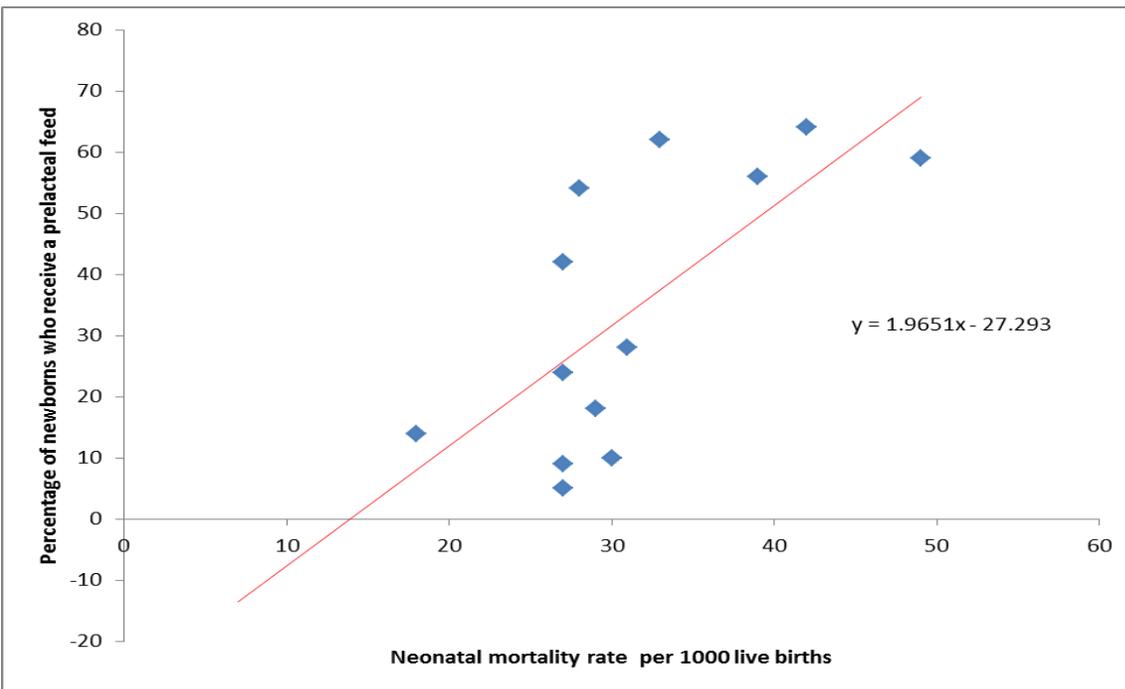
and 5) to get protected from illnesses (46-49).



**Figure 6:** Bloody and harmful traditional practices in Ethiopia (compiled from DHS 2005)

As a gross estimate, however, the interesting finding is that SSA countries with high prelacteal feeding (pre-lactation) also had increased neonatal mortality rate (Figure 7) (17,18). As described

above, however, it is difficult to say that the high neonatal mortality was attributed to prelacteal feeds alone, which is probably due to multiple factors.



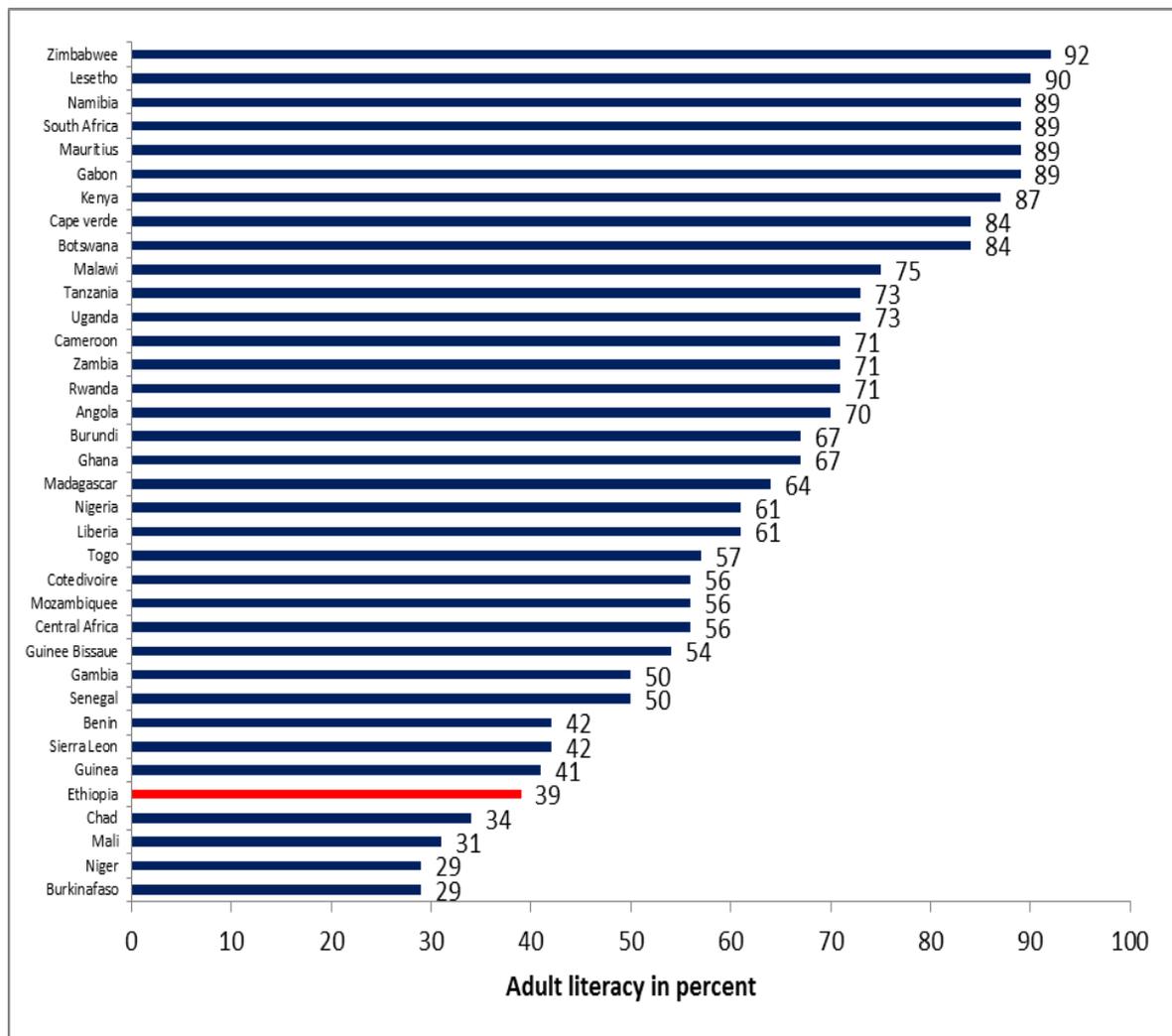
**Figure 7:** Regression analysis of prelacteal feeds with neonatal mortality (18,19).  $r = 0.7$ ;  $p = 0.008$

### Adult literacy rate

After a thorough review of all contributing factors, the authors' deduction is that low or no formal education and low income took the lion's share for the high maternal and perinatal mortality in Ethiopia-one as reinforcement for the other. Previous authors have shown the causal relationship of education and health-one more year education raises earnings by about 10% and increases the life expectancy by about 0.2 years (50). A number of studies have also firmly established the intimate linkage between the overall general health (particularly women's health) and the level of education of individuals in

particular and the society in general (50-52). Individuals illiterate for modern education are usually at higher risk of falling sick and having lower health care-seeking behavior.

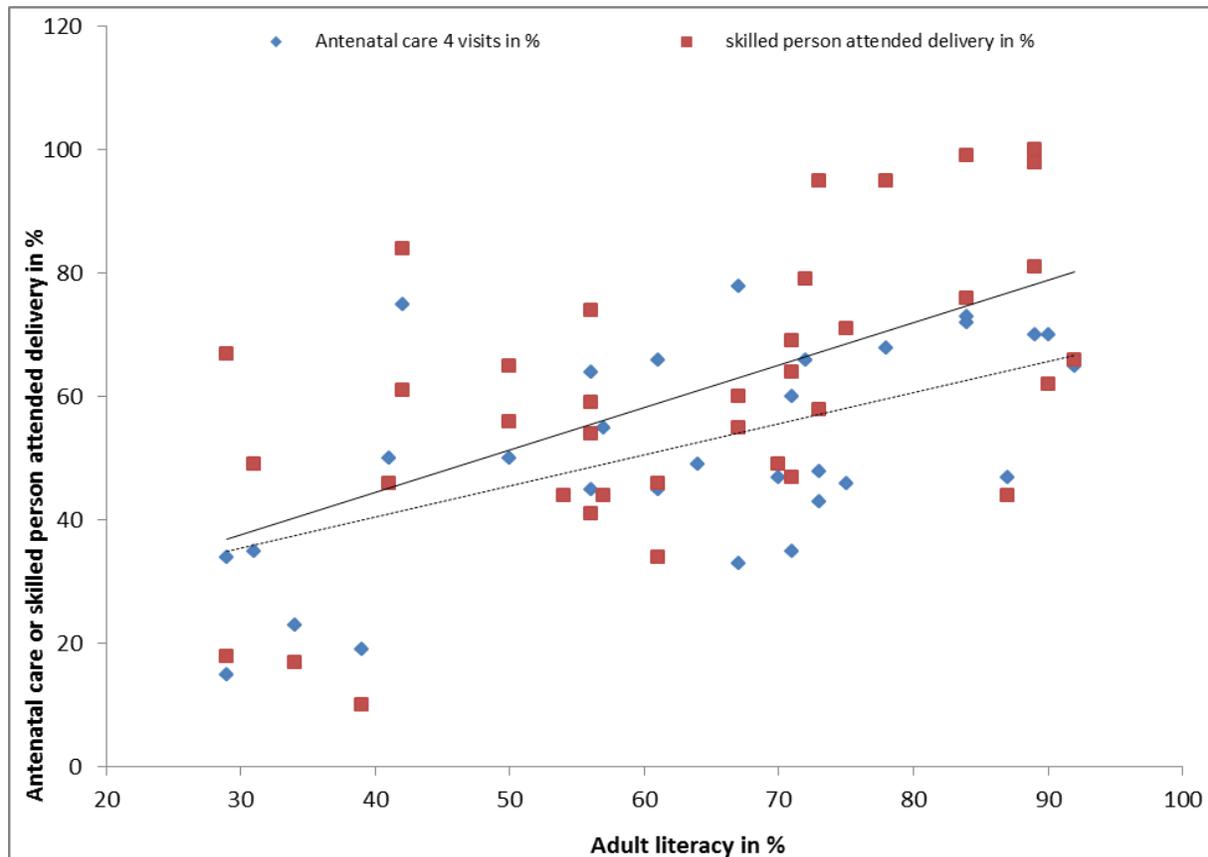
For the period of 2005-2011, the adult literacy rates of SSA countries are presented in Figure 8. Out of 36 included SSA countries, 28 (78%) countries have already achieved above 50% adult literacy and in 10 countries, their 75% - 92% adult population was literate. Ethiopian adult literacy rate (age 15+ years who can read and write) was reported to be about 39%, which was among the lowest in SSA.



**Figure 8:** The percentage of adult literacy rate in Sub Saharan Africa

As shown in Figure 9, the linear regression analysis of adult literacy with antenatal care (ANC) 4 visits and skilled person attended delivery in African countries demonstrated a positive correlation ( $r = 0.56$ ;  $P = 0.001$  for the ANC;  $r = 0.58$ ;  $P < 0.0001$  for the skilled person attended delivery). Other articles (53) extracted from this review have shown that African

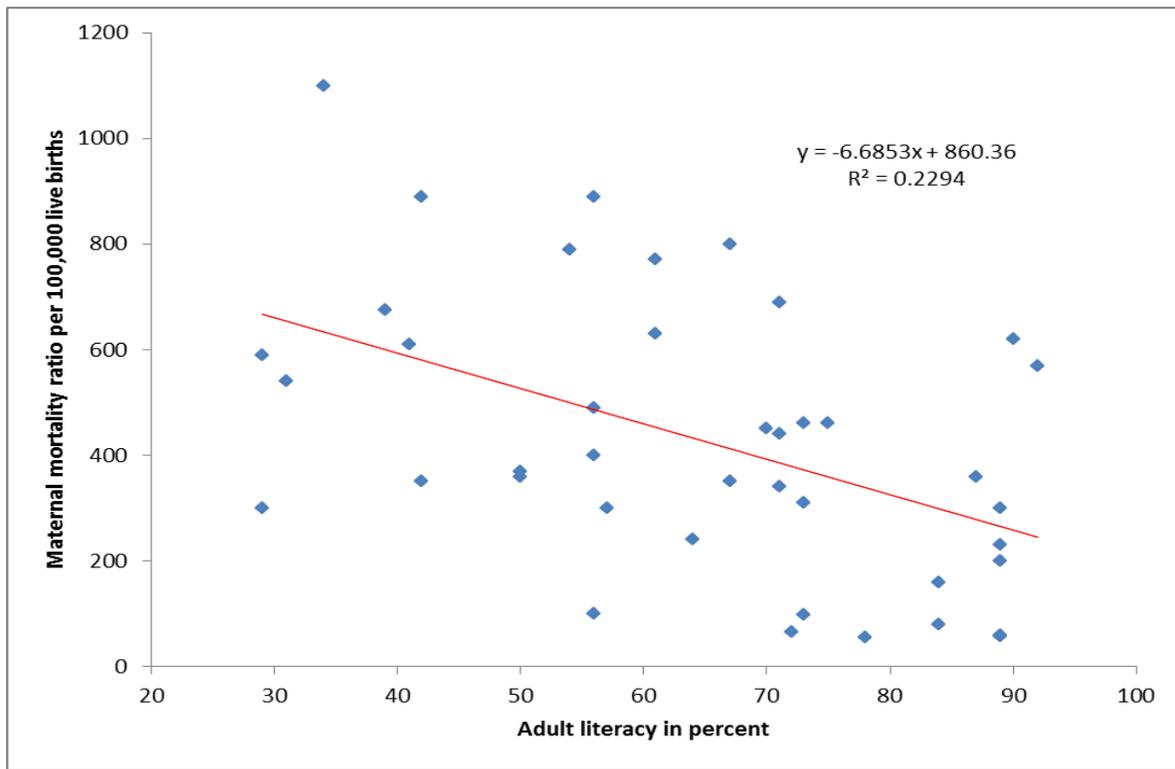
countries with low ANC or low skilled person attended delivery at the national level were found to have high maternal mortality. The increasing regression line trend with increasing proportion of adult literacy, ANC and skilled person attended delivery is an indirect evidence of the linkage between education and maternal and perinatal health.



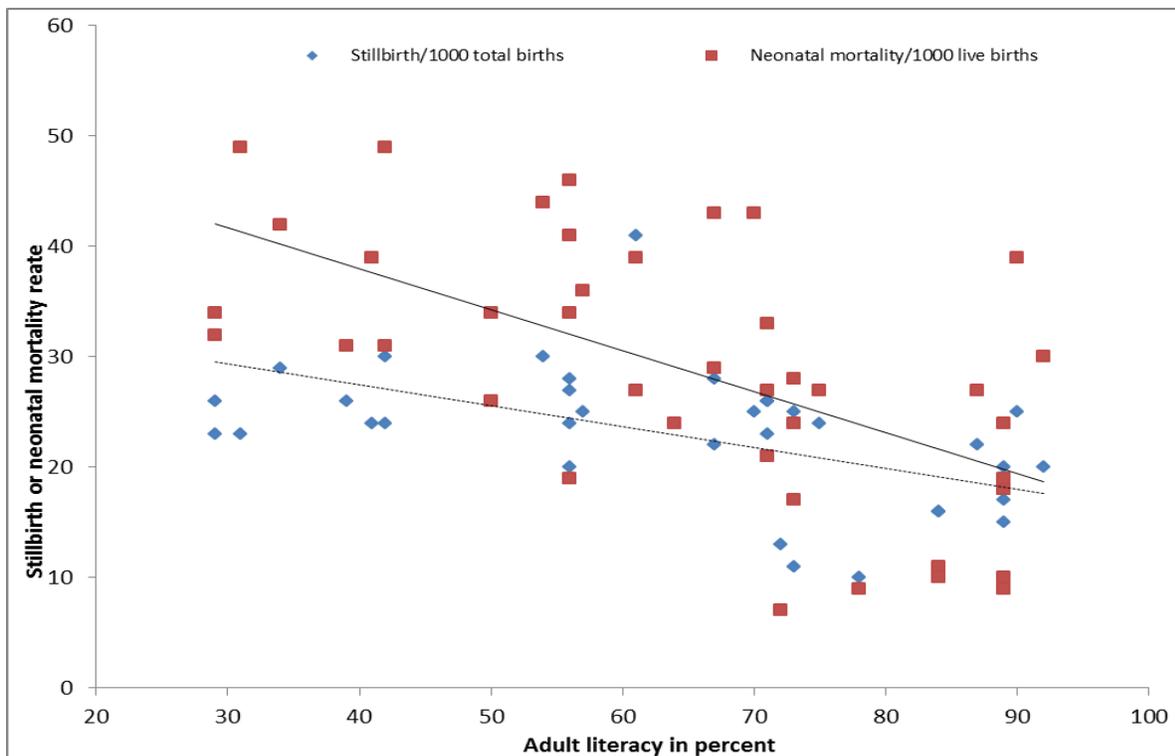
**Figure 9:** Linear regression analysis of adult literacy percentage with antenatal care (ANC) 4 visits and skilled person attended delivery percentage in African countries.  $r = 0.56$ ;  $P = 0.001$  (ANC);  $r = 0.58$ ;  $P < 0.0001$  (skilled person attended delivery)

Furthermore, Figures 10 and 11 show the negative correlation of MMR, stillbirth and neonatal mortality rates with the proportion of adult literacy at the national level in selected African countries. That is, those African countries with a low proportion of adult literacy were also having a high maternal mortality, stillbirth and neonatal mortality. The trend line for the neonatal mortality rate ( $r = -0.6$ ;  $P < 0.0001$ ) was more down-going than for the stillbirth rate ( $r = -0.5$ ;  $P < 0.0001$ ), probably due to the relatively low attention given to neonates than pregnant women (54).

In general, the positive correlation of national adult literacy proportion with national ANC and skilled person attended delivery proportion, and its inverse correlation with MMR, stillbirth and neonatal mortality rates indicates how important education is to improve the maternal and perinatal health. With the ongoing large scale investment in education by the Ethiopian Government, the authors are confident that a breakthrough in maternal and perinatal mortality reduction will come in the coming ten years.



**Figure 10:** Linear regression analysis of adult literacy percentage with maternal mortality ratio in African countries,  $r = -0.5$ ;  $P = 0.007$



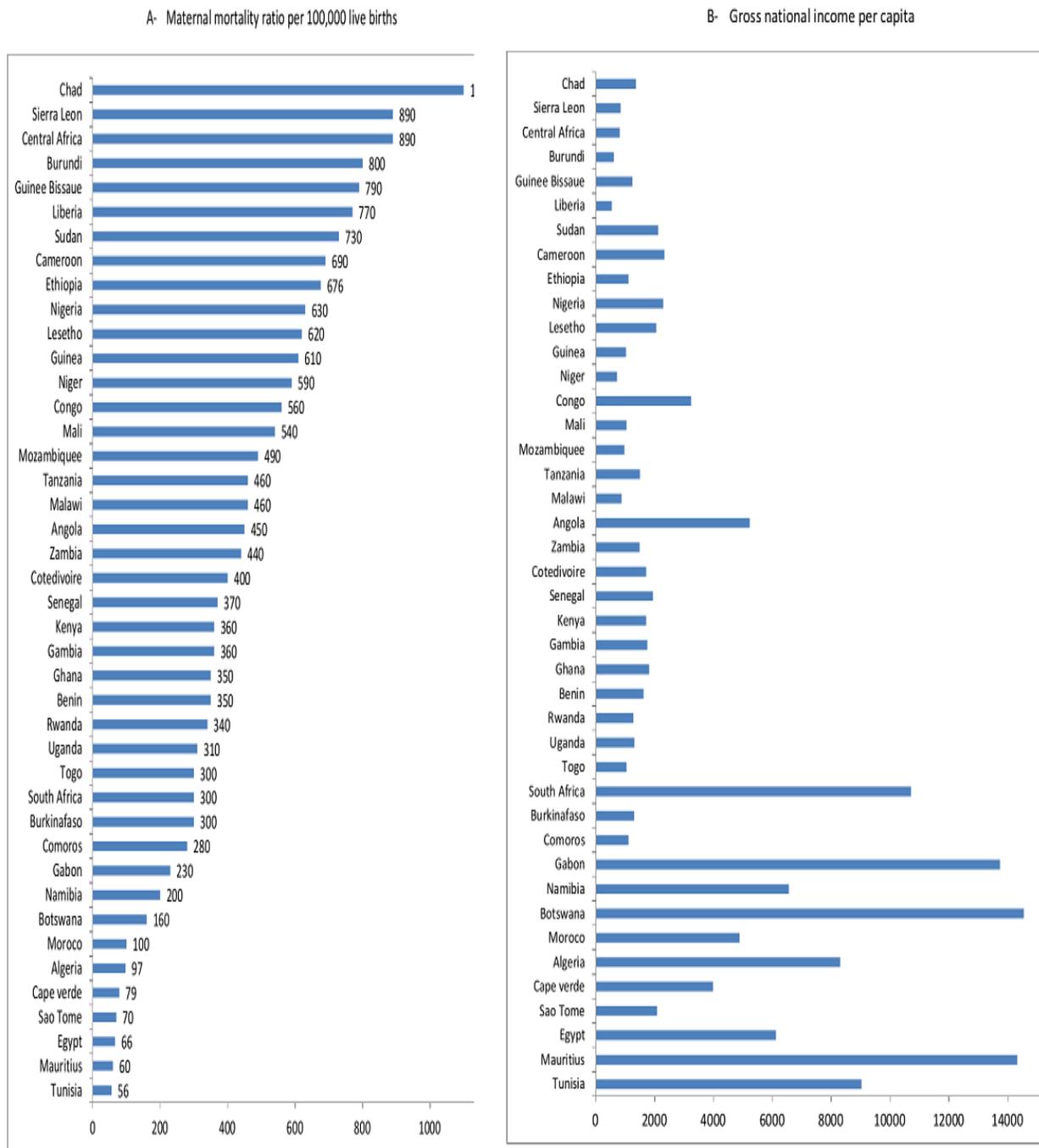
**Figure 11:** Linear regression analysis of adult literacy percentage with stillbirth and neonatal mortality rates in African countries.  $r = -0.5$ ;  $P < 0.0001$  (stillbirth rate);  $r = -0.6$ ;  $P < 0.0001$  (neonatal mortality rate)

**Level of income**

As described above, it is a known fact that income is a powerful engine in making a difference not only in the health sector but also in all aspects of human life. In African countries, it has been shown that the incapacitated health infrastructure and human resource for health were strongly correlated with high maternal and perinatal mortality (55), which was in turn probably because of the difference in the gross national income of the countries. A good indicator of the impact of income on health is the medical doctors' migration from their birthplaces to greener pasture areas. Specific to Ethiopia, in about 40 years, more than three-fourths of medical doctors graduated in the country migrated to developed countries, and as a result, the physician to population ratio remained among the lowest in the world (56).

The impact of low income on the public health (specifically on maternal and perinatal health) is beyond lack of health infrastructure and human resource for health (low production, high attrition, low motivation). Among others, lack of access to health facilities due to lack of transport or financial constraint, low level of education, lack of essential drugs and supplies, and lack of preferred contraceptive methods are directly related to the income of individuals and the public/government at large.

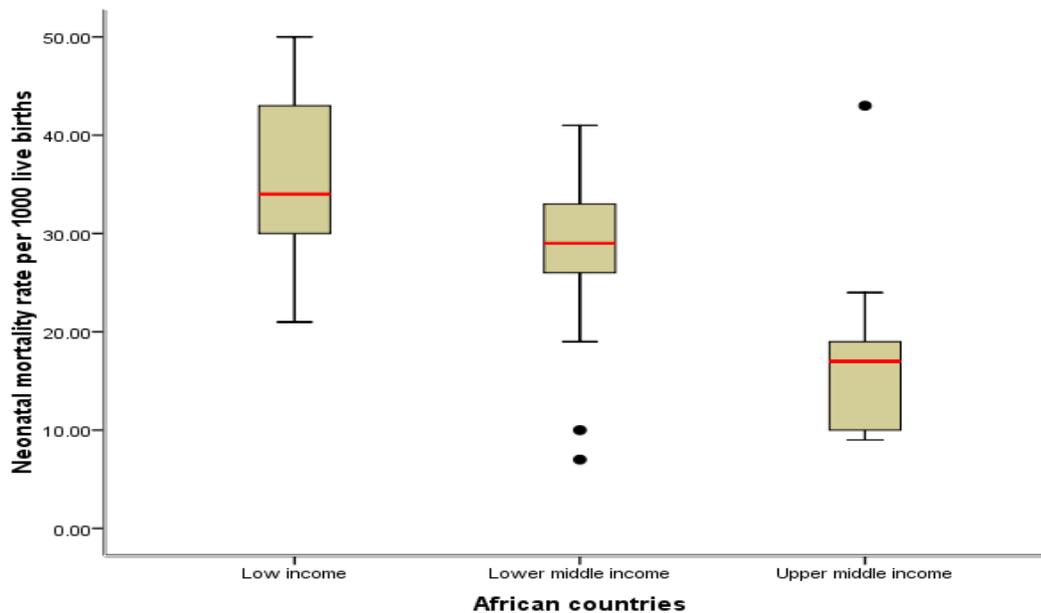
As shown in Figure 12, in many of the SSA countries, the MMR was inversely related to the gross national income per capita (gross national income divided by mid-year population) of the countries. The better the gross national income, the lesser the maternal mortality was. WHO ranked its member countries across the world as low income, low middle income, high middle income and high income (18).



**Figure 12:** Comparison of gross national income per capita with maternal mortality ratio in Africa

Taking the country's income status as a base (x-axis) and stillbirth and neonatal mortality rates as a test variable, Whisker and Box plots was developed (Figure 13). It has also demonstrated the inverse relation of income with stillbirth and neonatal mortality rates. The median stillbirth rate

and neonatal mortality rates of the upper middle income countries was much lower than those the low income and lower middle income countries. The medians of stillbirth and neonatal mortality for low income and low middle income countries, however, were close to each other.



**Figure 13:** The relation of income with stillbirth and neonatal mortality in selected African countries

It is a known that countries with low income are likely to have a low performance status on all indicators. Some of the plausible explanations for the inverse relation of MMR, stillbirth and neonatal mortality rates with the gross national income per capita may be lucidly visible:

1) A country with good income is likely to allocate more budget for the national health program. As a result, more health facilities could be built; most advanced medical equipment and supplies could be procured; highly skilled health professionals could be hired and retained. Furthermore, in service trainings relevant to maternal and perinatal health (BEmOC, CEmOC, postabortal care, PMTCT of HIV) will be offered to all clinicians working on maternal health; ambulance service can be all the time available; and health professional's salary could be attractive and motivating. This in turn will have multiple advantages: it creates a conducive working environment, increases the quality of the health services, boosts professionals' and patients' satisfaction and reduces health professionals' attrition rate from public health facilities in particular and the external brain drain in general (9, 57).

2) When the economic power of a country grows well, there will be a capacity to build all-time accessible roads, schools, and other facilities in the community. The construction of all these infrastructures will have a positive impact on maternal and perinatal health. When the country's economy grows in a healthy manner, individuals will have also their own share that will in turn increase their capacity to pay for health services and to afford for education and transport.

In conclusion, the TFR of Ethiopia remained in the high range; the unmet need for contraception was very high; the percentage of tonsillectomy and uvulectomy remains same; and the adult literacy rate was among the lowest in Africa. MMR, stillbirth rate and neonatal mortality rate had direct relations with total fertility rate and adult literacy rate. The gross national income had an inverse relation with MMR, stillbirth and neonatal mortality rates.

Therefore, to reduce maternal and perinatal mortality in the years to come, reducing the total fertility rate of women to the acceptable range, preventing the occurrence of unwanted and unplanned pregnancy as well as improving the literacy rate and income generating schemes for

the majority of Ethiopians should be considered as forefront actions.

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