

Effect of Women's Autonomy on Neonatal Mortality and Associated Factors in Ethiopia: A Cross-Sectional Population-Based Study

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Effect of Women's autonomy on neonatal mortality and associated factors in Ethiopia: A cross sectional population based study

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8 Abstract

9 **Introduction:** Women's decision-making autonomy is extremely important for the development of
10 maternal, neonatal, and child healthcare utilization. However, there's no evidence on the association of
11 women's decision-making autonomy with neonatal mortality rate at a national level in Ethiopia.
12 Therefore, this study aimed to assess the effect of women's autonomy on neonatal mortality rate and its
13 associated factors in Ethiopia.

14 **Methods:** A total of 5,128 neonates born 5 years before the survey from Ethiopian Demographic and
15 Health Survey 2016 were reviewed. A multivariable logistic regression model was employed to assess the
16 effect of women's autonomy and identify the determinate predictors of neonate death risk.

17 **Results:** The rate of neonatal mortality in Ethiopia was 20.7 per 1000 live births). Women's hadn't
18 autonomy in health care increase neonatal death by 2.72 times compared with those that had autonomy.
19 Hadn't postnatal care was caused to grown neonatal death by 5.48 times (AOR 5.48, 95%CI: 1.29, 23.26).
20 Delivering at a health institution had 0.61 times lowered neonatal death risk compared with delivering at
21 of health institution without a health facility(AOR 0.61, 95% CI: 0.38,0.97). Breastfeeding immediately
22 within 1hr after birth had 0.17 times reduce neonatal death risk compared with not initiation of
23 breastfeeding(AOR 0.17, 95% CI: 0.12,0.26). Women's gave birth single had 0.09 times reduced neonatal
24 death risk than those that gave birth multiple (AOR 0.09, 95% CI: 0.05,0.18). Unknowingly, male
25 neonates had a 1.84 times higher risk of death than females (AOR 1.84, 95%CI: 1.20,2.81).

26 **Conclusion:** Neonatal mortality rate was significantly related to women's hadn't deciding power on health
27 care, hadn't postnatal care, delivered out of health institution, breastfed not immediately, and gave birth
28 multiple. It is important to encourage mothers autonomy, use postnatal care service, and deliver in health
29 institutions.

30 **Keywords:** Women's Autonomy, Neonate, Mortality, Ethiopia

31 **Introduction**

32 Women's autonomy is the ability to access information and make decisions about one's own
33 business[1-3]. Hence, women's autonomy undoubtedly contributes to several health advantages for both
34 the mother and their children[4] and it's a priority of proceeding generations. Evidence suggests that
35 women in developing countries often have limited autonomy and control over their health regarded
36 decisions[2]. Even though, both the maternal and neonatal health provision needs a multi-sector approach
37 a robust decision-making autonomy of mother is vital for reversing back the barriers at the
38 household level[5]. Because, limited women's decision-making power delays maternal healthcare
39 utilization like antenatal care (ANC), postnatal care (PNC), and delivery health institutions[6-9]. Besides,
40 limited participation in access of health service for their on interst,lower involvement of women in
41 decision has also impact on the socio-economic, emotional, fertility decision, contraceptive use, and
42 sexual lifetime of the women[10], which results an entire population problem.

43

44 Studies show that the decision-making autonomy of females is low, specifically in developing countries.
45 However, scaling up the women's role in a decision leads to better uptake of healthcare access, poverty
46 reduction, and household economic growth[2, 11-16]. Indeed, in low-income countries, over women's
47 important role in the family, they essentially have seen as an ordinary homemaker.

48

49 In Ethiopia, studies show that maternal and neonatal health coverage is low[17]. According to the 2016
50 Ethiopian demographic health survey (EDHS 2016) report, only 11-18% of women were involved in
51 making decisions alone, and 66-68% together with their husband or partner[18]. Also, the neonatal
52 mortality rate in Ethiopia was 30death per 1000 live births[19]. Most importantly the first 28 days of life
53 is the most vulnerable time for a child's survival[20]. According to UNICEF, 2020 report, the death
54 proportion of neonates globally on average is 17 death per 1000 live births in 2019, and it dropped by
55 52% from 38 deaths per 1000 in 1990. Furthermore, the report also shows that around 2.4 million
56 children died in the first month of life and closely 6,700 children died every day of these about 33.33% of
57 all neonatal deaths occurring within the first day after birth, and close to 75% occurring within the first
58 week of birth in 2019[20].

59
60 Despite a downing in death rate of below the age of the first 28 days after birth in the globe, marked
61 differences in death rates found vary from place to pace in the world[20]. According to the recent
62 UNICEF report, East Africa and South Asia, placed at the top in neonatal death with a projected rate of
63 twenty seven and twenty five deaths per 1,000 live births in 2019, respectively[20]. The report also
64 showed that sub-Saharan Africa neonates was ten times greater risk of death than among who was born in
65 a developed world and the death risk of neonate in the highest death country was 55 times higher than its
66 counterpart. Of these event more than 50% of neonate deaths happened Ethiopia [20].

67
68 According to the sustainable development goal agenda of 2030 by improving maternal health care and
69 engagement of women can achieve the reduction of maternal and neonate, infant, and child mortality.
70 Hence, to achieving these targets requiring a scale-up of high impact and cost-effective maternal and
71 neonatal interventions in Ethiopia[21, 22]. Consequently, Women's empowerment in decisions is vital to
72 overcome the foremost mentioned problems. Therefore, this study aimed to assess the impact of women's
73 autonomy on neonatal mortality and associated factors in Ethiopia.

74 **Method**

75 **Data source, sampling and data collection**

76 The data for this study was extracted from the EDHS 2016. The EDHS 2016 is the fourth and most recent
77 in the Demographic and Health Survey series in Ethiopia[18]. The survey was conducted in 9 regional
78 states and 2 city administrations of Ethiopia[18]. Further details on sampling strategy can be found in the
79 DHS manual[18]. A total of 16,650 eligible women between 15 and 49 years were approached to be
80 interviewed. A response rate of 95% was observed with 15,683 women completing the interviews. The
81 survey incorporated both women who were permanent household residents as well as visitors of the
82 household. The survey contained variety of standard questionnaires recording information on basic socio-
83 demographic information and detailed bio-medical information. This study analysis only included
84 children less than one months of age, living with an eligible respondent, in accordance with the
85 denominator of the NMR definition, which resulted in a total weighted sample of 5128. The sample for
86 the survey was selected through a two-stage stratified random sample of households. At the primary stage
87 of sampling, 260 PSUs (82 in urban areas and 178 in rural areas) were selected using systematic sampling
88 with probability proportional to size. At the next stage of sampling, systematic random samples of about
89 30 and 36 households per primary sampling unit on the average in urban and in rural areas were selected
90 in all the regions respectively.

91 **Outcome variable**

92 The investigator used NMR as the outcome variable using the recommended definition as children age of
93 28 days after birth per 1,000 live births during a given year[20].

94 **Independent variables**

95 The independent variables included in this study were demographic and socioeconomic variables such as
96 (age, religion, region, husband education, wealth status of households, place of residence, sources of
97 drinking water, and availability of toilet facilities), maternal health characteristics like(age at first birth,

98 number of children born, previous birth interval, sex of the child, type of birth, place of delivery, mode of
99 delivery, PNC visits) and nutritional assessments like when the child put to breastfed. The current study
100 aimed to women's autonomy effect on neonates, which was leveled based on answered to "Who makes
101 the following decisions in (respondent's) household about 1) obtaining health care for yourself; 2) large
102 household purchases; 3) household purchases for daily needs, and 4) visits to family or relatives?"
103 Response choices were: a) respondent alone; b) respondent and husband/partner; c) respondent and other
104 people; d) husband/partner alone; e) someone else; f) other. The value of 1 is assigned if the response was
105 (a), (b), or (c), that is, the involvement of the respondent, or else 0, for no involvement of the respondent.

106 **Statistical analysis**

107 For all analyses in this study sampling weight was employed to manage sampling error and non-responses
108 obseravation. Further details on sample weights can be found in the EDHS report[20]. Descriptive
109 statistics were employed to show the distribution of background characteristics. Association between
110 neonatal mortality and the explanatory variables was assessed in bivariate analysis using Chi-square tests.
111 Logistic regression was used to assess the net effect of women's autonomy on neonatal death after
112 controlling several other control variables. Two models were used in the analysis. The first model
113 contained the variables related to women's autonomy. In the second model, other demographic and
114 socioeconomic characteristics were added. Prior to the multivariate analysis, multi-co linearity between
115 the variables was assessed. However, no multi-co linearity was found among the variables. In general all
116 models was performed with those variables showing $P < 0.25$ in the unadjusted analysis. Then after, the
117 multivariable model was reduced using the backward stepwise procedure and all the variables in the
118 multivariable model were variables for which $P \leq 0.05$. Both unadjusted and adjusted odds ratios (ORs)
119 were reported with 95% confidence intervals (95% CI). All analyses were performed using statistical
120 software SPSS (version 25).

121 **Ethics approval**

122 This study is a secondary analysis of publicly available dataset where permission was obtained through
123 registering with the DHS website and therefore no ethics approval was required.

124 **Results**

125 **Socio-demographic characteristics of study participants**

126 A total of 5,128 women were included in this study. The median age of the participants was 31 years.
127 Most of the study participants (48.8%) were Muslim by religion. The majority (69.2%) of the participants
128 had no education i.e. more than four out of six mothers. Almost(84.1%) of women were rural residents.
129 Regarding the education of the husband (52.2%) were hadn't education. Almost more than half(53.3%) of
130 the participants were poor by the combined wealth index of the family. Moreover, around 69.5%(3564)
131 and (55.1%) of the participant were had unimproved drinking water sources and toilet facility respectively
132 [Table 1].

133 **Reproductive history and neonate healthcare service-related characteristics**

134 From the total study participants, almost all (98.3%) of women had a parity of one, and most(55.4%) of
135 women gave first birth at the age of 18 to 25y. Two-thirds (66.2%) of women gave birth at respondents
136 home for their recent delivery and (46%) of women had a previous birth interval of 4y and above. Almost
137 more than half (51.3%) of neonates were male. Moreover, most (91.7%) of women hadn't postnatal
138 checkup within two months for their most recent delivery[Table 1].

139 **Decision-making status of women related characteristics**

140 About 82.1%, 75.7%, and 80.3% of women had involvement in decision making on their own health care,
141 large household purchases, and family or relatives visits respectively[Table 1].

142 **Neonatal mortality Rate**

143 The neonatal mortality rate in the five years preceding the survey was 20.7 deaths per one thousand live
144 births. The NMR varied significantly with different settings. For instance, the NMR was higher among

145 illiterate women (15 per 1000 live births) than among literate women (7 per 1000 live births). Similarly,
146 the NMR was significantly higher among women who were not involved in decision making for their
147 own health care (21 per 1000 live births) than among those who were involved in the decision-making
148 process for their own health care (19 per 1000 live births). The NMR was lower among women aged at
149 first birth 26 or more (1 per 1000 live births) than among other age groups (20 per 1000 live births) Via
150 women aged below 18 and 18-25 years. Furthermore, the NMR was lower among women residing in
151 urban(2 per 1000 live births) than among women residing in rural (19 per 1000 live births). The NMR for
152 Muslim women was higher(13per 1000 live births) than among women who had other religious groups (9
153 per 100 live births). Moreover, the NMR was significantly higher among home-delivered women(13 per
154 1000 live births) than among those who delivered at health institutions(7per 1000 live births). Unlikely,
155 the NMR was significantly higher for male neonates (14 per 1000 live births) compared to Female
156 neonates (7 per 1000 live births) i.e. the NMR for males was double. Similarly, NMR was significantly
157 higher among those who had multiple births (18 per 1000 live births) than among those who had single
158 births (3 per 1000 live births). The NMR was significantly higher among those who hadn't immediate
159 initiations of breastfed(14 per 1000 live births) than among those who had immediate initiations of
160 breastfed(6 per 1000 live births). The NMR was higher among those who hadn't PNC checkup within
161 two months(21 per 1000 live births) than among neonates who had PNC checkup(1 per1000 live
162 births)[Table 2].

163 **Factors associated with Neonate death and effect of women's decision-making
164 autonomy**

165 From the multivariable logistic regression analysis, women's involvement in their own healthcare-related
166 decision-making autonomy, Place of delivery, age at first birth, neonate sex, Plurality, breastfeeding, and
167 PNC had an association with neonatal death. Those women who hadn't involved in their own healthcare-
168 related decision-making autonomy were 2.72 (AOR=2.72; 95%CI: 1.41, 5.24) times higher risk of
169 neonate death risk compared to those who had involvement in maternal and child, neonate health-related

170 decision making autonomy. The death risk of the neonate for those women who delivered at health
171 institutions was 0.61(AOR=0.61; 95%CI:0.38,0.97) times lower than among those women who delivered
172 at their home. Similarly, the death risk of neonate among those women who hadn't PNC checkup was
173 5.48(AOR=0.61; 95%CI:0.38,0.97) times higher compared to among those women who had PNC.
174 Likewise, those women who had initiation of immediate breastfed were 0.17(AOR=0.17;
175 95%CI:0.12,0.26) times lower the death risk of neonate than its counterpart. Moreover, the likelihood of
176 neonate death among those women who had single birth were 0.09(AOR=0.09; 95%CI:0.05,0.18) times
177 lower compared to those women who had multiple births. Unlikely, the death risk of male neonates
178 were 1.84(AOR=1.84; 95%CI:1.20,2.81) times higher than female neonates. The death risk for those
179 women who gave birth of age at first birth 18-25 years were 0.32(AOR=0.32; 95%CI:0.10,0.99) times
180 lower compared to among those women who gave birth of age at first birth 26 and more[Table 3].

181 **Discussion**

182 Results show that the neonatal mortality rate in Ethiopia was 20.7 per 1000 live births. Thus indicating
183 the situation is alarming the country and need to be addressed by maternal and child health programs. In
184 the present study, the bivariate analysis result shows that women's autonomy (namely, decision making
185 regarding their own health care), Place of delivery, age at first birth, neonate sex, Plurality, breastfeeding,
186 and postnatal care service utilization are important variables in explaining neonatal mortality. The
187 multivariate analysis result confirmed most of the findings of the bivariate analysis. In the multivariate
188 analysis women's autonomy (decision making regarding their own health care), place of delivery, age at
189 first birth, neonate sex, Plurality, breastfeeding, and PNC were significant predictors of neonatal
190 mortality.

191

192 As do many other studies, this study also shows that neonatal mortality is significantly lower among those
193 mothers who were involved in decisions regarding their own health care compared to those who were not.
194 A possible reason could be that autonomous mothers are more capable of accessing available health

195 facilities and that they are able to greatly change the traditional balances of power and autonomy in
196 familial relationships, with profound effects on child care like reduce their reproductive behavior risks,
197 prolong birth intervals, utilize prenatal care, and immunize their children in general and result in lower
198 neonatal mortality. In addition, women can make decisions on delaying the age at first birth which plays a
199 valuable strategy to promote and improve neonatal health and survival. Usually, adolescent mothers face
200 financial and social problems that cause less provision of kid care. Indeed, the physiological immaturity
201 of teenage mothers causes more neonatal death since they may have a small uterus or narrow bony pelvis
202 and lack social experience in caring for newborns. As result empowering, women in decision-making
203 power might be answered all this problem. These findings are consistent with previous studies that
204 assessed the effect of Women's autonomy on maternal and child health service utilization[1, 2, 4-6, 8-10].
205 Evidence from the previous studies in India has also confirmed that a women's control over household
206 resources (ability to keep money aside) has a significant positive effect on both the demand for prenatal
207 care and the probability of hospital delivery[11].

208

209 The death risk proportion of neonates for those whose mother delivered without health facility was higher
210 compared to those whose mother delivered at health institutions. The difference might be happens due to
211 lack of adequate maternal and neonatal care at home. As a result, the newborn baby might not be take the
212 immediate nutrition after birth and it is also difficult to fix complication immediately if there is a problem
213 while the mother delivered at home. These findings are supported by the previous studies that focused on
214 the impact of institutional delivery on maternal health care as a result proper medical attention and
215 hygienic conditions during delivery reduce the occurrence of complications and infections which might
216 be caused to death or serious illness for the mother, baby, or both [3, 6, 15, 16, 19-22]. Indeed, delivered
217 with week health facility like no access of skilled providers, poor infrastructure, and substandard quality
218 of care causes to the risk of intrapartum-related deaths[7, 13]. However, quality of delivery services and
219 variations in newborn care practices weren't included in these analyses but could possibility affect the risk
220 of neonatal deaths.

221 The sex of the newborn also significantly associated with neonatal mortality. Unknowingly in this study
222 being male are more likely to die than among who are female. Even though, there is no previous study
223 supported the present study the problem might be due to bad cultural practices of the community.

224

225 The result of this study found that the probability of neonatal mortality is very high in the case of multiple
226 births. This effect is mainly associated with the lower birth weight of twins or triplets, which in turn is
227 one of the most important factors affecting neonatal survival. The reason might be that it needs extra
228 demand for food during the first day of the neonate. Since breastfeeding is one of the main sources of
229 nutrition, multiple births might cause neonates' lower calorie intake, and thus lower survival chances[1,
230 19]. Likewise, breastfeeding is a fundamental concern of proceeding the newborn's life, and the result of
231 this study shown that breastfeeding has a significant positive effect on neonatal mortality. The possible
232 reason might be the deleterious effects of infections related to neonatal deaths can be prevented by breast
233 milk especially practicing breast milk-fed within the first 1hour after birth. This practice not only
234 minimizing the death risk but also helps to wealth and brain development[22].

235

236 The death risk of neonate among those women who hadn't PNC checkup was 5.48 times higher compared
237 to those women who had PNC. This might be the prompt postnatal care (PNC) for both the mother and
238 the child is important to treat any complications arising from the delivery, as well as to provide the
239 mother with important information on how to safeguard herself and her kid. Evidence from the previous
240 studies on safe motherhood programs recommends that all women receive a check of their health within 2
241 days after delivery had a positive effect on the wellbeing of both mothers and neonates[19]. In relation to
242 this, a study in India and rural Sierra Leone indicated that postnatal care has a significant positive effect
243 on neonatal mortality[6, 11, 14, 17, 18, 21, 22].

244 **Conclusion**

245 In Ethiopia, neonatal mortality was significantly associated with women's hadn't decision making power
246 on health care, hadn't postnatal care, delivered without health institution, not immediately breastfeeding,
247 and gave birth multiple. Hence, it is important to encourage mothers autonomy, access to postnatal care
248 service, and broadened every woman delivery in health institutions in order to reach the Sustainable
249 Development Goals(SDG) of 2030. If programs focus on increasing women's autonomy, neonatal
250 mortality will decrease and the overall well-being of the family will be maintained and be enhanced.

251 **Strengths and limitations of the study**

252 This study was based on the recent EDHS(2016)with a nationally representative large sample size.
253 Moreover, this study applied both separated and simultaneously multivariable logistic regression
254 modeling to handle the influence of Women's decision making autonomy alone on neonatal mortality and
255 its associated factors on the basis of the EDHS data. Despite the above strengths, the study might have
256 recall bias since the participants were asked about the events that happened 5 years or more preceding the
257 survey. The study also shares the restrictions of cross-sectional studies.

258 **Abbreviations**

259

AOR	Adjusted Odds Ratio
CI	Confidence Interval
EDHS	Ethiopian Demographic and Health Survey
HIV/AIDS	Human Immune Virus
NMR	Neonatal Mortality Rate
PNC	Postnatal Care
SDG	Sustainable Development Goal
SPSS	Statistical Package for Social Science
STI	Sexually transmitted Infections

Availability of data and materials

The data set supporting the conclusions of this article is held by the authors and the Central Statistical Agency, CSA, Ethiopia, and the de-recognized data may be made available if a unique request is crafted from CSA website (<https://www.csa.gov.et>).

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Ethics approval and Consent

Not applicable.

Conflicts of Interest

The author declare that there is no competing interests.

Funding

Not applicable.

Authors' Contributions

HDM developed the idea of the study, acquired the research proposal, carried out statistical analysis and draft the manuscript.

Author's Detail

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References

1. Adhikari, R. and Y. Sawangdee, *Influence of women's autonomy on infant mortality in Nepal*. Reproductive Health, 2011. **8**(1): p. 7.
2. Osamor, P.E. and C. Grady, *Women's autonomy in health care decision-making in developing countries: a synthesis of the literature*. International journal of women's health, 2016. **8**: p. 191-202.
3. S, G. and J. H-S, *The Role of Women's Autonomy and Experience of Intimate Partner Violence as a Predictor of Maternal Healthcare Service*

- Utilization in Nepal.* International Journal of Environmental Research and Public Health, 2019. **16**(5): p. 895.
4. Jahan, F., S. Hossain, and K. Mahmud, *FACTORS INFLUENCING WOMEN'S DECISION MAKING POWER: EVIDENCE FROM BANGLADESH URBAN HEALTH SURVEY DATA*. IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS), 2015. **3**: p. 133-150.
 5. Hou, X. and N. Ma, *The effect of women's decision-making power on maternal health services uptake: evidence from Pakistan*. Health Policy Plan, 2013. **28**(2): p. 176-84.
 6. Adhikari, R., *Effect of Women's autonomy on maternal health service utilization in Nepal: a cross sectional study*. BMC women's health, 2016. **16**: p. 26-26.
 7. Asweto, C., et al., *Maternal Autonomy, Distance to Health Care Facility and ANC Attendance: Findings from Madiany Division of Siaya County, Kenya*. American Journal of Public Health Research, 2014. **2**: p. 153-158.
 8. World Health, O., *Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division: executive summary*. 2019, World Health Organization: Geneva.
 9. UNICEF, W., World Bank and U-DPD, *Levels & Trends in Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation United Nations Levels & Trends in Child Mortality*. 2017.
 10. Mekonnen, T., et al., *Women's Empowerment as a Determinant of Contraceptive Use in Ethiopia:Further Analysis of the 2011 Ethiopia Demographic and Health Survey* D.F.A.R.N. 82, Editor. 2013, Calverton, Maryland, USA: ICF International: .
 11. Maitra, P., *Parental bargaining, health inputs and child mortality in India*. Journal of Health Economics, 2004. **23**(2): p. 259-291.
 12. Asweto, C., et al., *Maternal Autonomy, Distance to Health Care Facility and ANC Attendance: Findings from Madiany Division of Siaya County, Kenya*. American Journal of Public Health Research, 2014. **2**(4): p. 153-158.
 13. Munabi-Babigumira, S., et al., *Factors that influence the provision of intrapartum and postnatal care by skilled birth attendants in low- and middle-income countries: a qualitative evidence synthesis*. The Cochrane database of systematic reviews, 2017. **11**(11): p. CD011558-CD011558.

14. Cornish, H., et al., *Women's economic empowerment and health related decision-making in rural Sierra Leone*. Culture, Health & Sexuality, 2019: p. 1-18.
15. Belachew, A., T. Tewabe, and G. Dessie, *Neonatal mortality and its association with antenatal care visits among live births in Ethiopia: a systematic review and meta-analysis*. The Journal of Maternal-Fetal & Neonatal Medicine, 2020: p. 1-8.
16. Kassaw, A., A. Debie, and D.M. Geberu, *Quality of Prenatal Care and Associated Factors among Pregnant Women at Public Health Facilities of Wogera District, Northwest Ethiopia*. Journal of Pregnancy, 2020. **2020**: p. 9592124.
17. Hagaman, A.K., et al., *The impacts of quality improvement on maternal and newborn health: preliminary findings from a health system integrated intervention in four Ethiopian regions*. BMC Health Services Research, 2020. **20**(1): p. 522.
18. (Ethiopia), C.s.a.C. and ICF, *Ethiopian demographic and health survey*. 2016: Addis Ababa, Ethiopia, and Rockville, Maryland UC and I. No Title.
19. survey, E.m.d.a.h., *Ethiopian mini demographic health survey*. 2019, Ethiopian public health institute: Addis Ababa, Ethiopia, and Rockville, Maryland UC and I, editor.
20. UNICEF, *Neonatal mortality - UNICEF DATA Monitoring the situation of children and women*. 2020.
21. Wilunda, C., et al., *Evaluation of a maternal health care project in South West Shoa Zone, Ethiopia: before-and-after comparison*. Reproductive health, 2016. **13**(1): p. 95-95.
22. Memirie, S.T., et al., *A cost-effectiveness analysis of maternal and neonatal health interventions in Ethiopia*. Health Policy and Planning, 2019. **34**(4): p. 289-297.

Tables

Table 1: Selected background characteristics of the participants

Characteristics		%	N
Women's autonomy			
Decision on own health care	Involvement of respondents	82.1	4212
	without involvement of respondents	17.9	916
Decision on making large household purchases	Involvement of respondents	75.7	3882
	without involvement of respondents	24.3	1246
Decision on visits to family or relatives	Involvement of respondents	80.3	4116
	without involvement of respondents	19.7	1012
Demographic and socioeconomic characteristics			
Age group in years	< 25	15.1	775
	25-29	30.5	1562
	30 or older	54.4	2791
Religion	Orthodox	30.1	1541
	Muslim	48.8	2504
	Others	21.1	1083
Residence	Urban	15.9	816
	Rural	84.1	4312
respondents Highest level of education	No education	69.2	3550
	Primary	23.4	1200
	Secondary	5.1	259
	Higher	2.3	119
Highest level of husbands/partner education	No education	52.2	2676
	Primary	32.6	1671
	Secondary	8.8	449
	Higher	6.5	332
Wealth index of the family	Poor	53.3	2734
	Medium	15.1	775
	Rich	31.6	1619
Availability of toilet facility	No	44.9	2304
	Yes	55.1	2824

Source of drinking water	Unimproved	69.5	3564
	Improved	30.5	1564
Reproductive history and neonate healthcare service-related characteristics			
Place of delivery	Respondents home	66.2	3396
	Health facility	33.8	1732
Preceding birth interval in years	<2	20.6	1057
	2-3	33.3	1710
	4 or more	46.0	2361
Age at first birth	<18	43.3	2218
	18-25	55.4	2842
	26+	1.3	68
Sex of child	Male	51.3	2631
	Female	48.7	2497
Plurality	Single	98.3	5042
	Multiple	1.7	86
Breastfeeding status	Immediate	71.0	3640
	Not immediate	29.0	1488
PNC check up within two months	No	91.7	4702
	Yes	8.3	426
Neonate status within the 1st 28 days	Alive	97.9	5022
	Died	2.1	106

Table 2 neonatal mortality rates (per 1,000 live births) for 5-year periods preceding the survey, by background characteristics (N = 5,128)

Characteristics		NMR
Women's autonomy		
Decision on own health care*	Involvement of respondents	19
	without involvement of respondents	21
Decision on making large household purchases	Involvement of respondents	15
	without involvement of respondents	21
Decision on visits to family or relatives	Involvement of respondents	17
	without involvement of respondents	21
Demographic and socioeconomic characteristics		
Respondents age group in years	< 25	3
	25-29	7
	30 or older	12
Religion*	Orthodox	6
	Muslim	13
	Others	3
Residence*	Urban	2
	Rural	19
respondents Highest level of education	No education	15
	Primary	5
	Secondary	1
	Higher	1
Highest level of husbands/partner education	No education	12
	Primary	7
	Secondary	1
	Higher	1
Wealth index of the family	Poor	12
	Medium	5
	Rich	3
Availability of toilet facility	No	11
	Yes	10

Source of drinking water	Unimproved	15
	Improved	6
Reproductive history and neonate healthcare service-related characteristics		
Place of delivery*	Respondents home	13
	Health facility	7
Preceding birth interval in years	<2	6
	2-3	6
	4 or more	9
Age at first birth**	<18	11
	18-25	9
	26+	1
Sex of child***	Male	14
	Female	7
Plurality***	Single	18
	Multiple	3
Breastfeeding status***	Immediate	6
	Not immediate	14
PNC check up within two months*	No	21
	Yes	1

Note *** Significant at $p < 0.001$; ** = $p < 0.01$ and * = $p < 0.05$

Table 3 Adjusted odds ratios (OR) and 95% confidence interval (CI) for neonatal mortality within the past five years preceding the survey by selected predictors

Selected predictors	Model I		Model II	
	OR	CI	OR	CI
Women's autonomy				
Decision on own health care	Involvement of respondents	1.00		1.00
	without involvement of respondents(ref.)	1.91*	1.02,3.59	2.72** 1.41,5.24
Demographic and socioeconomic characteristics				
Residence	Urban			0.52 0.23,1.20
	Rural(ref.)			1.00
Respondents age group in years	< 25			0.61 0.31,1.19
	25-29			1.00 0.63,1.59
	30 or older(ref.)			1.00
Religion	Orthodox			1.19 0.57,2.45
	Muslim			1.94 0.99,3.77
	others(ref.)			1.000
Highest level of husbands/partner education	No education			1.52 0.49,4.72
	Primary			1.65 0.53,5.15
	Secondary			0.77 0.18,3.25
	Higher(ref.)			1.00
Wealth index of the family	Poor			0.83 0.44,1.54
	Medium			1.03 0.52,2.04
	Rich(ref.)			1.00
Availability of toilet facility	No			1.12 0.68,1.84
	Yes(ref.)			1.00
Source of drinking water	Unimproved			0.70 0.45,1.11
	Improved(ref.)			1.00
Reproductive history and neonate healthcare service-related characteristics				
Place of delivery	Health facility			0.61* 0.38,0.97
	Respondents home			1.00

Preceding birth interval in years	<2			1.62	0.95,2.74
	2-3			1.08	0.66,1.77
	4or more(ref.)			1.00	
Age at first birth	<18			0.48	0.16,1.49
	18-25			0.32*	0.10,0.99
	26+(ref.)			1.00	
Sex of child	Male			1.84**	1.20,2.81
	Female(ref.)			1.00	
Plurality	Single			0.09***	0.05,0.18
	Multiple(ref.)			1.00	
Breastfeeding status	Immediate			0.17***	0.12,0.26
	Not immediate(ref.)			1.00	
PNC check up within two months	No			5.48*	1.29,23.26
	Yes(ref.)			1.00	
Constant		0.014***		0.05*	
-2log likelihood		1026.77		861.51	
Cox & Snell R square		0.001		0.033	

Note *** Significant at $p < 0.001$; ** = $p < 0.01$ and * = $p < 0.05$