Associated Factors of Caesarean Section in Ethiopia Using 2016 Demographic Health Survey Data; Community Based Cross Sectional Study

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Research note

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Abstract

Objective:The rate of caesarean section is increasing in Ethiopia, recently. Identifying associated demographic health factors was the aim of this study.

Results:More educated mothers were more delivering by C-section compared with those illiterate. Those mother having higher body mass index were more likely to deliver with caesarean section (p = 0.0001). C-section was increased when mothers go to elder (p = 0.0001). Maternal education, birth order, preceding birth interval, multiple pregnancy, maternal age and interaction effect BMI with household wealth index statistically significantly associated factors to increase the rate of C-section. Residence and region were community level factors to increase caesarean section.Therefore; community awareness creation towards C-section with its side effect is essential in Ethiopia.

Introduction

Caesarean section has more preferring by mothers in the world lately. Caesarean section improves infant and/or maternal outcomes. However, when used inappropriately the potential injury may exceed the benefit [1–4]. Caesarean section has risks on both mothers and babies[5, 6]. It is more expense than vaginal delivery despite of the fact that the rate of c-section is increasing. c-section is international concern to prevent its risk [7, 8].

The rate of c-section has been increasing in the world due to health demographic factors [9–11]. However, WHO suggested, the incidence should be less than 15% of total deliveries[12–14]. Lately, C-section is increasing in Ethiopia because of the improvement of obstetric care service [10, 14–16].

Due to the fact that many factors have been proposed for increment of c-section rate across the world[15, 17, 18]. Little information was available on demographic health factors to increase the rate in Ethiopia. Therefore; This study intended to assess associated demographic health factors to increase c-section and it contributes additional information about its deliveries. This research will be vital to provide some input for future studies.

Methods

Study Design and Setting

Community based cross- sectional study was conducted using 2016 Ethiopian Health and Demographic Survey data collected from January 18 to June 27, 2016.Specific questions were asked a woman(age 15–49) about their pregnancy and birth in the five years preceding the survey. 7,193 women were eligible for the study. The 2016 EDHS data set has a hierarchical structure as women are nested within geographic regions and residence. The hierarchy for this study follows individuals as level–1, regions and residence as level–2.

Inclusion and Exclusion Criteria

All woman (age 15–49) who give birth within five years to the study were considered during the 2016 EDHS survey was included.

Dependent Variable: Mode of delivery was a dependent variable (0coded as vaginal and 1 as c-section deliveries).

Explanatory Variable: Explanatory variables were region, residence, religion, maternal age, BMIs, maternal education, household wealth index, birth order, preceding birth interval, terminated pregnancy ever, ANC, contraceptive use, anaemic status, multiple pregnancy, drug take for intestinal disease, sex of child.

Statistical Analysis and Model

Bivariable and multivariable analyses were employed. The bivariable analysis was applied to examine association between each of the explanatory variables and c-section.

Multilevel logistics model was used to comprehend community variation and identifying individual level demographic health factors associated with c-section. For model comparison, log likelihood and AIC was applied using R statistical software..

Results

A total of 7193 mothers were eligible. Out of these mothers 256 were delivered by CS. Six hundred thirty seven (8.85%) mothers had previous history of terminated pregnancy.Among these mothers, 31(4.87%) had delivered by CS.

Of the 256 mothers, most of them were54.29% orthodox Cristian, 33.20% were primary school educated, 78.13% were from richest households,12.11% had been previous history of terminated pregnancy, 9.37% had taken the drug for intestinal disease, 51.95% had used modern contraceptive method, and 93.75% had multiple pregnancy.

Among 256 mother's, the average birth order and ANC was 2.31 (SD = 1. 83) and 5.59 (SD 3.25,), respectively (See Table 1). Looking mothers had been delivered by c-section regarding community factors, 21.9% were residing in Addis Abeba, and 12.7% were from urban areas. (See Table 1 from appendix and Table 2).

Among 6937 vaginal delivered mothers, 4317(62.23%), 2411(34.76%) and 6331(91.26%)were not educated, from poorest household and hadn't previous history of terminated pregnancy, respectively. The average ANC of mothers were 2.78(SD. 5.56), BMIs 20.68(SD. 3.29).

Table 2 Bivariate analysis of association between community level factors with c-section, EDHS 2016

Covariates	C- section n(%)	All vaginal births n(%)	p-value
Region			<.0001
Tigray	21(2.7)	751(97.3)	
Afar	6(0.9)	641(99.1)	
Amhara	16(2.1)	748(97.9)	
Oromia	14(1.4)	1017(98.6)	
Somali	5(0.6)	801(99.4)	
Benshangul	6(1)	570(99.0)	
SNNP	23(2.6)	870(97.4)	
Gambella	6(1.1)	528(98.9)	
Harari	46(11.2)	365(88.8)	
Addis Abeba	82(21.9)	293(78.1)	
Dire Dewa	31(8.1)	353(91.9)	
Residence			0.000
Urban	192(75)	1320(19.03)	
Rural	64(25)	5617(80.97)	

Bivariate analysis of factors associated with c-section and covariates considered for individual and community factors was presented in Table 1 in appendix and Table 2.

Multivarable multilevel logistic regression analysis of c-section

Measure of association and random intercepts for c-section are presented in appendix Table 3. The results of the empty model (Model 1) indicated that there was a significant variation c-section between communities (random intercept variance = 1.064, p-value = 0.000).

Similarly, the ICC in the empty model implied that 24.44 % of the total variance in the delivery method was credited to differences between communities.

In Model 2 only level–1 variables were added. From this, maternal education, birth order, preceding birth interval, multiple pregnancy, maternal age, household wealth index and interaction effects body max index with household wealth index were significantly associated with c-section. The ICC in Model 2 indicated that, 23.79% of the variation in c-section were accountable to differences across communities. As shown by PCV, 3.5% of the variance in c-section across communities was explained by individual level characteristics.

Model 3 only community level variables were added. The result revealed that a woman residing in rural and from Somali, Gammbella, Harreri, Addis Abeba and Dire Dewa regions were significantly associated with c-section. The ICC showed that differences between communities account 23.98% of the variation in woman c-section. In addition, the PCV indicated that 2.4% of variation of c-section was explained by community level characteristics.

Model 4, the final model included both level–1 and level–2 characteristics simultaneously which have p-value less than 0.1 from the bivariate analysis. The estimated ICC, 23.48% of the variability in c-section was accountable to differences between communities. The PCV indicated that, 5.1% of the variation in c-section across communities was explained by both individual and community level factors. After adjusting other individual and community level factors.Covariates;maternal education, birth order, preceding birth interval, multiple pregnancy, maternal age, household wealth index and interaction effects of BMIs and household wealth index in level–1; residence and region (Gambella, Hareri, Addis Abeba and Dire Dewa) in level–2 were significantly associated with c-section.

The odds of undergoing c-section was 2% (AOR = 1.02, 95% CI 0.96–1.027), 3% (AOR = 1.03; 95% CI 1.02–1.05) and 14% (AOR 1.14; 95% CI 1.11–1.16) more likely a mother had primary education,secondary education and higher education compared to woman who hadn't educated, respectively. The odds of experiencing c-section were 1.7% (AOR = 0.993; 95% CI 0.99–0.995) less likely if a mother having one birth order increased.Similarly, mothers having more preceding birth interval was 1.0005 (AOR = 1.0005; 95% CI 1.0003, 1.001) times more likely to deliver by c-section.

Regarding the woman having multiple pregnancy was 12% (AOR = 1.12; 95% CI 1.08–1.15) more likely to give birth by c-section. Likewise, a woman becoming older was 1.0920 (AOR = 1.092; 95% CI 1.055, 1.130) folds more likely to deliver by c-section as compared to younger. The odds of delivered by c-section of a woman from the richest households were 22% (AOR = 0.78; 95% CI 0.73–0.48) smaller than as compared to women from the poorest households. For one unit increased of BMIs, the odds giving birth by c-section was 1% (AOR = 1.01; 95% CI 1.008–1.02) higher among a woman from the richest household.

Similarly a woman in rural residence was 2% (AOR = 0.98; 95% CI 0.96–0.998)less likely to give birth by c-section delivery compared to their urban counterparts. Looking Region, women residing from Gambella had 2% smaller (AOR = 0.98; 95% CI 0.96–99), Harri had 7% higher (AOR = 1.07; 95% CI 1.05–1.09), Addis Abeba had 10% higher (AOR = 1.1, 95% CI 1.06–1.12) and Diere Dewa had 4% higher (AOR = 1.04, 95% CI 1.01–1.06) were more likely of delivery by c-section as compared to women residing from Tigray. SeeTable 3 in the Appendix.

Discussion

Community based cross-sectional study design was conducted using 2016 EDHS data collected from January 18 to June 27, 2016. The aim of the study was to identify associated demographic health factors of c-section.

The findings showed that woman's had more educated, more likely to deliver by c-section. This result lower than and consistent with previous findings [1, 13, 19, 20].The possible reasons could be, educated woman's might search a means to minimize absorbate and more worry their health. The difference might be sample size.

The odds of mothers who had delivered by c-section were less likely for one birth order increase. The findings consistent with studies conducted at Felege Hiwot Referral Hospital, Bahir Dar and it is lower than its result [19]. The possible explanation could be mothers had more birth order, prepare themselves by living style and doing tasks used to easily opening uterus due to experience of birth. May the sample size makes this difference.

The study showed that mothers had more proceeding birth interval, more likely undergoing to c-section. This finding was agreed with another study inside and outside the country[21, 22]. The reason could be mothers who had more preceding birth interval; the uterus will not open easily.

The study also revealed that mothers had faced multiple pregnancies was more likely to deliver by c-section. This finding was agreed but lower than studies done in the country and developing countries [13, 19, 20, 23]. The explanation could be mothers had faced multiple pregnancies were more seek skilled care services due to fear of labour. This difference may be the sample size.

Surprisingly, the finding revealed that number of ANC had not statistically significant effect on c-section. The results consistent a study conducted in Wolayta Sodo [20, 23]. The reasons could be they consult skilled person if they start ANC earlier.

The study revealed that maternal age had been increased by one year, mothers had most likely undergoing to c-section. This finding was agreed and lower the study conducted outside the country [14, 15, 19, 21, 24].The explanation could be sample size difference and a woman who had more age, their uterine not flexible to birth and they had prolong absorbate.

The findings of this study verified that a woman from the richest households had smaller odds of delivery by c-section for a unit increment of BMIs. This is consistent with the findings that have been reported in prior studies [20, 21].The possible explanation could be related to private health institution. In addition, mothers from richest household having more access to get information from media. The interaction effect of household wealth index with BMIs was included the difference could be due to it.

In the study, mothers from rural residence had less likely to deliver by c-section than mothers from urban. This finding was agreed and lower than with other studies done inside and outside the countries [20, 22, 25]. This could be due to the fact that mothers from rural residence having less chance to access hospitals, and ANC. In addition to this, most woman from a rural residence were poor, both economically and information than urban woman. But, this was inconsistent with a study conducted at Felege Hiwot referral hospital[20, 24]. This variation was occurring due to sample size difference.

Similarly, the chance of mothers undergoing to c-section from Gambella was less likely; but mothers from Harerri, Addis Abeba, and Diere Dewa more likely than mothers from Tigray region. The findings consistent

with the studies conducted in Ethiopia [20]. This observation may be the access of getting health institutions in the region.

Conclusion

The findings revealed that demographic health factors associated with c-section were maternal education, Birth order, multiple pregnancy, preceding birth interval, maternal age, household wealth index and interactions of household wealth index with BMI sin individual characteristics. Residence and region were community level factors associated with c-section. There was variety of c-section from residence and regions in Ethiopia. As a recommendation, community awareness about uses and side effects of c-section need to be enhanced. Health centrer should be creating awareness about the association between contraceptive and delivery.

Limitation Of The Study

The study was used secondary data suffer from missing values and unreliable information. Use of primary data which is collected the immediate users is preferable to minimize missing values and access medical (obstetric) indicator factors. The woman who answers their question as much as they remember it since EDHS was used retrospective design so the respondent's may answer usually underestimate in socio-demographic factors and overestimate health related factors. Therefore, the use of this information for comparison and decision-making should consider the inherent limitation of the study.

Acronyms

ANC = antenatal care

EDHS = Ethiopian demographic health survey

DHS = Demographic health survey

CS = Caesarean section

EA = Enumerate Area

sd = Standard deviation

Declarations

Ethics approval and consent to participate

Not Applicable.

The researcher have taken the data from the Ethiopian demographic, health survey and it was secondary. The researcher conducted this study in accordance with the guidelines laid down in the Declaration of

Helsinki and all procedures involving human subjects. During the data collection, the participants were agreeing consent letter. For further information, contact the author.

Consent for publication

Not Applicable.

Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author and EDHS 2016 on reasonable request.

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Not applicable.

Authors' contributions

AGZ was responsible for the study design. AGA & AMA contributed the statistical analyses and interpretation of the results. AGA & MG drafted the manuscript and revised it critically and all authors approved the final version.

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Competing interests

The author declares that they have no competing interests.

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Tables

Table 1 Bivariate analysis of associatedfactors at individual level demographic health variabl with c-section N=17193

Covariates	C-Section n(%) mean(sd)	All vaginal birth n(%) mean(sd)	p-value
Religion			0.000
Orthodox & Catholic	139(54.29)	2279 (32.85)	
Protestant	42(16.41)	1296(18.68)	
Muslim	74(28.90)	3250(46.85)	
Other	1(0.39)	112(1.61)	
Education			0.000
Not Educated	42(16.41)	4317(62.23)	
Primary	85(33.20)	1857(26.77)	
Secondary	56(21.88)	521(7.51)	
Higher	73(28.52)	242(3.49)	
Wealth index			0.000
Poorest	17(6.64)	2411(34.76)	
Poorer	12(4.69)	1167(16.82)	
Middle	13(5.07)	1015(14.63)	
Richer	14(5.47)	903(13.02)	
Richest	200(78.13)	1441(20.77)	
Smoking status			0.719
No	254(99.22)	6867(98.99)	
Yes	2(0.78)	70(1.01)	
Sex of child			0.328
Male	140(54.69)	3578(51.58)	
Female	116(45.31)	3359(48.42)	
Terminated pregnancy			0.062
No	225(87.89)	6331(91.26)	
Yes	31(12.11)	606(8.74)	
Contraceptive Use			0.000
Using modern Method	133(51.95)	1979(28.53)	
Using Traditional Method	10(3.91)	37(0.53)	
Non user intends to use later	72(28.13)	2042(29.44)	
Does not intended to use	41(16.02)	2879(41.50)	
Drugs take for intestinal disease			0.215
No	232(90.63)	6478(93.38)	
Yes	24(9.37)	459(6.62)	
Multiple Pregnancy			0.000
Single	240(93.75)	6842(98.63)	
Multiple	16(6.25)	160(1.37)	
Anemia			0.001
Sever	2(0.78)	117(1.69)	
Moderate	11(4.30)	659(9.50)	

Mild	44(17.19)	1535(22.12)	
Not Anemic	199(77.73)	4626(66.69)	
Birth order	2.31(1.83)	3.98(2.56)	0.000
Preceding birth interval	60.51(34.98)	40.95(23.55)	0.000
ANC	5.59(3.25)	2.78(5.56)	0.000
Age	30.08(5.94)	29.23(6.87)	0.000
BMIs	20.81(3.43)	20.68(3.29)	0.001

Table.3 Multilevel logistic regression analysis of individual and community level demograpl health factors associated with c-section, 2016EDHS

Covariates	Model 1	Model 2	Model 3	Model 4
	AOR (95%CI)	AOR (95%CI)	AOR (95%CI)	AOR (95%CI)
Education level (Not Educated)	1			1
Primary	1.02(1.01-1.03)*			1.02(0.96-1.027)*
Secondary	1.04(1.01-1.05)*			1.03(1.02-1.05)*
Higher	1.14(1.11-1.17)*			1.14(1.11-1.16)*
Birth order	0.992(0.98-0.995)*			0.993(0.99-0.995)*
Preceding birth interval	1.0005(1.0003-1.0007)*			1.0005(1.0003-1.001)*
Child is twin (Single)	1			1
Multiple	1.12(1.08-1.16)*			1.12(1.08-1.15)*
Contraceptive (modern Method)	1			1
Traditional Method	1.05(0.998-1.1)			1.05(0.99-1.105)
Non user &not use later	0.997(0.987-1.01)			0.998(0.98-1.009)
Not intended use	0.989(0.97-1.001)			0.99(0.97-1.002)
ANC	1.001(0.99-1.002)			1.001(0.999-1.002)
Women Age	1.003(1.001-1.004)*			1.003(1.002-1.004)*
Anemic Status (Sever)	1			1
Moderate	0.994(0.96-1.03)			0.99(0.96-1.03)
Mild	0.996(0.964-1.03)			0.99(0.96-1.03)
Not Anemic	0.99(0.96-1.02)			0.99(0.961-1.024)
BMIs	1.0003(0.997-1.003)			1.00(0.997-1.003)
Household Wealth index (Poorest)	1			1
Poorer	1.01(0.93-1.11)			1.013(0.93-1.11)
Middle	0.99(0.89-1.09)			0.99(0.897-1.09)
Richer	0.97(0.89-1.07)			0.97(0.88-1.07)
Richest	0.79(0.74-0.85)*			0.78(0.73-0.84)*
BMIs: household wealth index (Poorest)	1			1
BMIs: Poorer	0.998(0.99-1.003)			0.99(0.99-1.003)
BMIs: Middle	1.00(0.995-1.01)			0.99(0.99-1.01)
BMIs: Richer	1.00(0.99-1.01)			1.001(0.996-1.005)
BMIs: Richest	1.01(1.008-1.015)*			1.01(1.008-1.02)*
Residance(Urban)			1	1
Rural			0.93(0.91-0.94)*	0.98(0.96-0.998)*
Region (Tigray)			1	1
Afar			0.99(0.97-1.01)	1.02(0.99-1.04)
Amhara			0.99(0.98-1.02)	0.99(0.98-1.014)
Oromia			0.99(0.97-1.01)	1.004(0.98-1.02)
Somali			0.98(0.96-0.99)*	1.01(0.99-1.02)
Benshangul			0.99(0.97-1.01)	0.99(0.98-1.02)
SNNP			1.005(0.98-1.02)	1.004(0.98-1.02)
Gambella			0.98(0.96-0.99)*	0.98(0.96-0.99)*

Hareri			1.07(1.05-1.09)*	1.07(1.05-1.09)*
Addis Abeba			1.14 (1.11-1.18)*	1.1(1.06-1.12)*
Dire Dewa			1.03(1.004-1.05)*	1.04(1.01-1.06)*
Communities variance(se)	1.064(0.602)	1.027(0.027)	1.038(0.037)	1.01(0.0102)
ICC	0.2444	0.2379	0.2398	0.2348
PCV	Ref	3.5%	2.4%	5.1%
Model fit				
log likelihood	2169.56	2477.435	2268.38	2479.626
AIC	-4333.119	-4902.87	-4510.76	-4925.308

*Significant at p-value <0.05