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Bypassing primary health facilities and associated factors among mothers seeking skilled birth attendance at Nigist Eleni Mohammed memorial comprehensive specialized hospital Hossana, Central Ethiopia, 2023

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Abstract

Background: Bypassing primary health care facilities is “a delivery that takes place in the health facility that is not the closest to mothers’ home”. Bypassing imposes financial hardship to women, inefficient use of resources within health care system, inadequate and low quality of services, and high out-of-pocket expenditure Objective: This study aims to assess bypassing primary health care facility and associated factors among women seeking delivery service in Nigist Eleni Mohammed Memorial Comprehensive Specialized (NEMMCS) hospital. **Method:** Facility based cross sectional study design was employed from February to March 2023. Systematic random sampling was used to choose participants. Bivariate and multivariable logistic regression model were applied to determine the association between dependent and independent variables. The strength of association was determined using odds ratio with 95% confidence interval. Statistical significance was declared at a P-value less than 0.05. **Result:** This study indicated that 68.5% participants bypassed the nearest PHC facility. Educational status of respondents Adjusted Odds Ratio (AOR) 4.1(95% CI: 1.55 -11.10), perceived service quality AOR 0.37(95% CI: 0.16 -0.85, availability of drugs and supplies AOR 0.32(95% CI: 0.13 -0.75), and information on the need to have referral letter AOR 0.20(95% CI: 0.09-0.47) were factors that affect bypassing. **Conclusion:** Given more specialist care at tertiary hospitals, the proportion of bypassers in current study seems significantly high. **Recommendation:** Ministry of health should strengthen

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and improve primary health care facilities giving special emphasis on provision of adequate human power and medical supplies.

Keywords: *Bypassing, PHC facilities, Delivery service, NEMMCS hospital, Ethiopia*

1. Introduction

Bypassing primary health care facilities is defined as " a delivery that take place in the health facility that is not the closest to the mothers' home"(Mubiri *et al.*, 2020). In addition to putting women in financial hardship, bypassing causes the health care system to use resources ineffectively and inefficiently (Salazar *et al.*, 2016). It impedes the accomplishment of Universal Health Coverage (UHC), the primary goal of Sustainable Development Goal (SDG) (Commitments and Ownership, 2017). The worst outcomes associated with bypassing include, but not limited to, inadequate coverage of services in lower health care facilities, low quality of services, and high out-of-pocket expenditure (Assefa *et al.*, 2020).

The progressive reduction seen in Maternal Mortality Rate (MMR) over the past 25 years (Group, 2015) is particularly attributed to increased skilled birth attendance at health institutions. The major emphasis given to expanding primary health care facilities, and the especial effort made in the training of middle level professionals provided an easy access to basic obstetric care (Theses and Sciences, 2020). Therefore, the obstetrics care given at lower health care facilities forms the base of service pyramid.

In the hierarchical health care system, majority of women seeking skilled birth attendance are expected to be served in primary health care facilities, and those with high risk pregnancy are referred to the next higher level (Kruk *et al.*, 2009).

Though the hierarchy of health care delivery differs from country to country, Ethiopian health sector has introduced a three tire health care delivery system which ranges from primary to tertiary (Addis, 2010). Maintenance of integrity and optimal care at each level across the tier demands compliance with protocol of referral system.

Referral system consists of client, expertise, and medical equipment transfer between health facilities. Effective and optimal utilization of health facilities can be ensured through well-functioning referral system. In Ethiopia, despite impressive progress made for the last two decades, strong referral system is not yet established. One of the technical challenges encountered in the enforcement of the system is uneven distribution of the number of patients. Revision of existing strategies remains the next best measure to provide comprehensive information on national referral system and give direction on the current and new standards (LIU, 2020)

Availability of basic obstetrics care within reachable distance brought significant contribution to achievement of basic health care services in the past several years (Demographic and Survey, 2019; EMoH, 2010). While the provision of basic health care service is continued at most peripheral public health facilities, patients often tend to access the health services at a higher level with greater extent of bypass rate (Forrest *et al.*, 2001; Olani, 2015). Primary healthcare facilities are, of course, the first point to receive patients with any health care needs. Those requiring specialist care are screened out and get referred to the next higher level. Contrary to this fact, patients usually bypass the nearest health care facility, and cause unnecessary crowding in referral hospitals (Kivuva, 2021).

Evidence from published literatures clearly revealed that a significant proportion of mothers bypassed nearest health facility for child birth (Salazar *et al.*, 2016; Shah, 2016; Rajman and Mahomed, 2019). The extent of bypassing ranged from 37% in India (Salazar *et al.*, 2016), to 55% in Chitwan, Nepal (Shah, 2016), 75% in Tanzania (Exavery *et al.*, 2016), and 76% in Kenya (Theses and Sciences, 2020). As revealed in existing literature, in Ethiopia, 82% of patients in the outpatient department (OPD) claimed to be self-referred (Olani, 2015). In cases where there is inappropriate referral (one of which is self-referral), service quality is apparently compromised, health services are subjected to increased cost, lower facilities are underutilized, and the higher health care centres are overburdened (Salazar *et al.*, 2016; Kamau *et al.*, 2017; Sabde *et al.*, 2018; Anyanwu *et al.*, 2015).

Bypassing along with scarce resource will ultimately hinder the attempts made to achieve the right to highest attainable standard of health (Toebes, 2014). Therefore, it remains crucial to identify driving force behind bypass phenomenon and show the way forward. Vast majority of existing reports on factors of bypassing are consistent though few of them remain contradictory based on differences in health care system and population groups of a particular study (Salazar *et al.*, 2016; Sabde *et al.*, 2018).

The reported demographic factors associated with higher odds of bypassing include: age (Pillay and Mahomed, 2019; Adoyo *et al.*, 2021), educational status (Kivuva *et al.*, 2021; Bayou, 2014; Li *et al.*, 2021), employment status (Kivuva *et al.*, 2021), and first pregnancy (Kruk *et al.*, 2009; Bayou, 2014). Previous histories of health service utilization that include ANC use and delivery service utilization (Of and Sciences, 2015) are reported to have association with bypassing. Pregnancy related complications (Salazar *et al.*, 2016; Adoyo *et al.*, 2021), perceived health care quality (Kruk *et al.*, 2009; Bell *et al.*, 2020; Karkee *et al.*, 2015), and accessibility of health care facility (Shah, 2016; Fisseha *et al.*, 2017) are consistently shown to affect bypassing of PHC facilities.

In Ethiopia, while there are reports on bypassing of patients, they were limited to population of outpatient department (OPDs). Given the specific behaviour of obstetrics population (Sanders *et al.*, 2014), understanding the extent of bypassing in this particular population remains an important phenomenon. To my knowledge, no published literatures are identified to explain the condition particularly in the study setting. Furthermore, the persistent overcrowding of maternity unit in Nigist Eleni Mohammed Memorial comprehensive specialized (NEMMCS) hospital further triggered the present study; raising the suspicion that bypassing could have occurred. Therefore, this study aims to assess extent of bypassing and associated factors among women seeking delivery service in NEMMCS hospital.

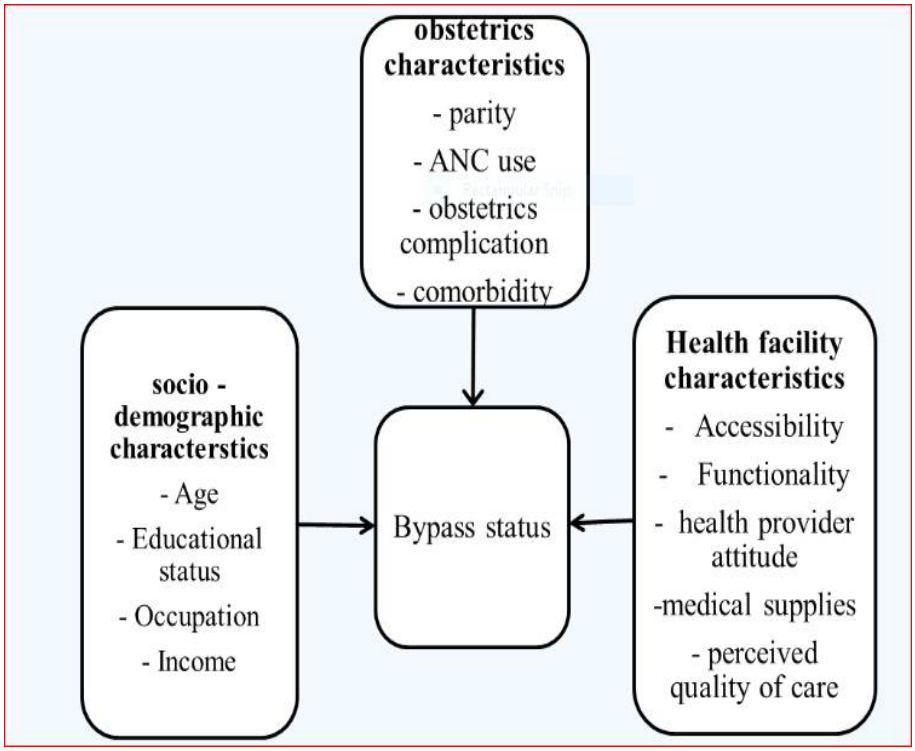

Figure 1: Conceptual frame work that shows relationship between dependent and independent variables

2. Methods and material

2.1. Study area and period

A facility based cross –sectional study was conducted at Nigist Eleni Mohammed Memorial Comprehensive and Specialized hospital (NEMMCS) hospital from February 1 to March 30, 2023. NEMMCS hospital is located

in Hossana town, Hadiya zone, central Ethiopia. It is located 232 km far from Addis Ababa (capital city of Ethiopia). The Hospital is established in 1982, during Dergue regime. It is supposed to serve 3.2 million peoples in Hadiya zone and nearby districts. It provides preventive, curative, and rehabilitative health services organized in four case teams: outpatient, inpatient, emergency and critical care, maternal and child health, with capacity of 350 beds and 825 total workers. The maternity unit includes the ANC unit, labor and delivery ward, immunization, family planning, and postnatal ward. The hospital provides comprehensive delivery service, with an average of 6480 cases managed annually (Wachemo University Annual Bulletin, 2020).

2.2. Population

Source population: All women admitted to the postnatal ward at Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital.

Study population: All women admitted to the postnatal ward of NEMMCS hospital during data collection period.

Sample size determination and sampling technique: The sample size was calculated using a single population proportion formula with the assumptions of a 95% confidence interval, 5% of marginal error, and a proportion of 47.2% from a study conducted in Kenya (Adoyo *et al.*, 2021). Adding 10% non-response rate, the final sample size was calculated as

$$n = \frac{(Z\alpha/2)^2 (p)(1-p)}{d^2} + 10\%$$

where: n = is sample size

$$n = \frac{(1.96)^2 (0.472)(1-0.472)}{(0.05)^2} + 10\%$$

$$n = \frac{(1.8017104)(0.531)}{0.0025} + 10\% = 383 + 38 = 421$$

Sampling technique and procedure: NEMMCS hospital was selected because it is the only referral hospital in the town. Information of client flow for the past one year preceding the survey was obtained from registry of maternity unit, and the monthly average flow of clients was computed. Systematic Random Sampling (SRS) was used to choose participants, and the interval between the consecutive participants was determined to give equal probability of inclusion in the study. Accordingly, the average number of women who sought delivery service in the past one year preceding the survey was known to be 6480. This gives an equivalent monthly average flow of 540 women. Dividing the monthly average for desired sample size, K was determined to be 2. Therefore, every second postnatal woman was selected for interview, and the first participant was selected randomly.

Eligibility criteria: Women delivered at NEMMCSH and admitted to postnatal ward were included in the study. Women who gave birth in other facility and admitted to postnatal ward for any indication of postnatal complication and those unable to consent because of severe illness were excluded

2.3. Data collection tool and procedure

The data collection tool was adapted from similar literatures, considering local context. The data collection tool contained socio-demographic variables which include (age, religion, educational status, and monthly income); obstetrics variables (parity, gravidity, ANC use, previous pregnancy complication, co-morbidity); characteristics of nearby PHC facility (quality of care, physical accessibility and functionality of health facilities, waiting time, charges of service, availability of drug and supplies); and information on bypass status (availability of referral letter, reason for bypassing, information on the need to have referral letter).

The data were collected using interviewer-administered, structured, questionnaire. Five BSc midwives and three health professionals with master's degree in health science were, respectively recruited for data collection

and supervision. Data collectors and supervisors were trained on the objectives of the study, contents of the questionnaire, and issues related to participants' rights.

2.4. Data quality control and assurance

The tool was initially prepared in English and then translated in to local language (Amharic). The Amharic version was translated back in to English with the help of language experts to check its consistency. Data collection tool was pretested on 5% of sample size at another general hospital, and amendment was made on tool contents accordingly. Data collectors were trained, and the data collection process was closely monitored by supervisors and Principal Investigator (PI). Filled questionnaires were checked for completeness at daily basis.

2.5. Data processing and analysis

The collected data were checked for completeness. After editing and coding, the data were entered in to EpiData version 4.6. The analysis was performed by exporting the data in to SPSS version 25 statistical software. Cleaning of data for inconsistencies and missing value was done. Descriptive statistics such as the mean, frequency, and percentage was computed to summarize the data. Bivariate analysis was done, and all explanatory variables having an association with outcome variable at a P-value of less than 0.25 were included in multivariable analysis model. Model fitness was checked using the Hosmer and Lemeshow goodness of fitness test. Odds ratio with its 95% Confidence Interval (CI) was used to show the association between the explanatory and the outcome variable. Level of statistical significance was declared at a P-value less than 0.05

2.6. Study variables

Dependent variable: Bypass status.

Independent variables include: (1) Socio-demographic variables**:** age, educational status, religion, occupation, income; (2) obstetrics variables: parity, no of living children, place of delivery, mode of delivery, obstetric complications, ANC use, and comorbidity; (3) Health facility characteristics: accessibility, functionality, health workers' attitude, medical supplies, perceived quality of care.

2.7. Operational definition

Bypass status: It is a condition in which pregnant women come to NEMMCSH with referral letter or not. Pregnant women who directly come from home to NEMMCSH for child birth service are considered as bypassers. Those who come from PHC facilities with referral letter are none- bypassers.

Child birth services: Professional assistance of the child birth process.

Delivery: Process of giving child birth

Perceived quality of care: How a women perceived the quality of care in terms of access to qualified health personnel, patient privacy, and availability of necessary medical supplies.

Referral system: A practice whereby a primary health care provider moves the patient to higher level of care when the need for specialist care arises.

Referral: Transfer of a patient from one clinician / health facility to the other advanced setting for on-going management.

2.8. Ethics and informed consent

All procedures carried out in this study considered ethical standards of health research and approved by Wachemo University with reference number WCU–IRB 0012/23. Ethical clearance was obtained from the Institutional Review Board (IRB) of Wachemo University. Letter of cooperation was written to NEMMCS hospital. Written informed consent was obtained from study participants. Data privacy and confidentiality of individual participant was assured. Participants' right to participate or not to participate in the study was respected.

3. Results

3.1. Socio-demographic characteristics of study population

From the interviewed 421 participants, valued response was collected from 410, making the response rate of 97%. Forty-two percent of participants were found in age group between 25-29, with mean age of 28 years. One-third of the participants had completed secondary education, and about 37.8% of their spouses had completed primary education. The Majority (86.3%) of participants were Christians, and more than half (58.5%) of them came from ethnic origin of Hadiya (Table 1).

Table 1: Socio-demographic characteristics of women seeking delivery service in NEMMCS Hospital, Hossana, Ethiopia, 2023

S/No	Socio–demographic variables		Frequency	%
1	Age (in years)	20-24	84	20.5
		25-29	173	42.2
		30-34	106	25.9
		≥35	47	11.9
2	Educational status of respondent	No formal education	67	16.3
		Primary education complete	121	29.5
		Secondary education complete	139	33.9
		College / University complete	83	20.2
3	Spouse's educational status	No formal education	17	4.1
		Primary education	155	37.8
		Secondary education	135	32.9
		College / University	103	25.1
4	Religion	Christian	354	86.3
		Muslim	56	13.3
5	Occupation	Employed	273	66.6
		unemployed	137	33.3
6	Ethnicity	Hadiya	240	58.5
		Kambata	93	22.7
		Gurage	43	10.5
		Siltie	21	5.1
		Others**	13	3.2
7	Monthly income	≤2857 ETB	234	57.1
		>2857 ETB	176	42.9

Note: ** =Amhara, wolayta, % = percentage.

3.2. Obstetrics characteristics of study participants

From the total interviewed population, more than three fourth (314) were multipara. The proportion of multipara whose last delivery took place at hospital account 39.8%, and about 45.6%(187) of them had experience of Spontaneous Vaginal Delivery (SVD). More than half (227) of the multipara had no history of previous

obstetrics complication. About 93.9% of respondents claimed that their recent pregnancies were planned, and 9 out of 10 had ANC follow up, where nearly 50% of them had more than 4 visits (Table 2).

Table 2: Obstetric characteristics of study participants at NEMMCS Hospital, Hossana, Ethiopia, 2023

S/No	Obstetrics variables		Frequency (n = 410)	%
1	Parity	Primipara	96	23.4
		Multipara	314	76.6
2	Place of last delivery	Home	4	1.0
		Health centre	148	36.1
		Hospital	163	39.8
3	Mode of previous delivery	SVD	187	45.6
		Instrumental delivery	76	18.5
		Caesarean delivery	52	12.7
4	Past history of obstetrics complication	Yes	88	21.5
		No	227	55.4
5	Recent pregnancy planned	Yes	385	93.9
		No	25	6.1
6	ANC follow up during recent pregnancy	Yes	382	93.2
		No	28	6.8
7	Place ANC received	Nearest HC	147	35.9
		NEMMCSH	228	55.6
		Private clinic	7	1.7
8	Number of visits of ANC	<4 visits	153	33.3
		≥4 visits	229	55.9
9	Satisfied by staffs' treatment	Yes	129	31.5
		No	253	61.7
10	Complications identified during recent pregnancy	Yes	176	42.9
		No	206	50.2
11	Informed place of birth by care provider	Yes	297	72.4
		No	85	20.7
12	Suffered any illness recently	Yes	28	6.8
		No	382	93.2

3.3. Accessibility and functionality of PHC facility

More than half (227) of the total respondents reported that their residence is five or more kilometres far from the nearest health centre. From total participants included in the study, 39.5% of them had history of birth in the nearest health centre, where 4 out of 10 women reported good perceived quality of service (Table 3).

Table 3: Distribution of responses on accessibility and functionality of PHC facility among women seeking delivery service at NEMMCS Hospital, Hossana, Ethiopia, 2023

S/No	Variables		Frequency	%
1	Distance from health centre (n = 410)	<5 km	183	44.6
		≥5 km	227	55.4
2	Hx of birth in the HC (n = 410)	Yes	162	39.5
		No	248	60.5
3	Waiting time (n = 162)	>30 min	76	46.9
		≤30 min	86	53.1
4	Perceived quality of service (n = 162)	Good	64	39.5
		Not good	98	60.5
5	Availability of drugs and supplies (n = 162)	Yes	75	46.2
		No	87	53.8
6	Charges to delivery service (n = 162)	Yes	10	6.2
		No	152	93.8
7	HC function for 24 hr (n = 162)	Yes	155	95.6
		No	7	4.4

3.4. Bypass status of study population

This study identified that 68.5%(281) of participants directly come from their home, without formal referral letter. Majority of bypassers had attended formal education. Three-fourth of bypassers perceived low quality of care at PHC facilities. Distance from health centre (39.1%), lack of drugs and supplies (22.1%), and lack of operation facilities in HC (19.2%) were subjectively ranked reasons for bypassing. About 62.4% of participants have no information on the need to have referral letter while seeking care at referral hospitals (Table 4).

Table 4: Distribution of responses on bypass status and its perceived reason among study participants in NEMMCS Hospital, Hossana, Ethiopia, 2023

S/No	Variables		Frequency	%
1	Directly come from home	Yes	281	68.5
		No	129	31.5
2	Reason for bypass (n = 281)	HC far from my home	110	39.1
		Lack of operation in the HC	54	19.2
		Lack of drugs and supplies	62	22.1
		Dissatisfaction with the service	28	10
		HC not fully functional	27	9.6
3	Have information on the need to have referral letter	Yes	154	37.6
		No	256	62.4

3.5. Factors associated with bypassing

Bivariate and multivariable logistic regression analyses were conducted to find out significant association between the outcome variable and the explanatory variables. Multicolinearity was checked using VIF, and none of the variables violated the assumption.

The candidate variables (P < 0.25) from bivariate analysis entered in to multivariable binary logistic regression, where only 4 variables had shown significant association with outcome variable. These are: maternal educational status AOR 4.1(95% CI: 1.55-11.1), perceived service quality AOR 0.37(95% CI: 0.16-0.85), availability of drugs and supplies AOR 0.32(95% CI: 0.13-0.75), and information on referral procedure AOR 0.20(95% CI: 0.09-0.47).

From multivariable analysis, we noted that mothers having formal education were 4 times more likely to bypass nearest primary health care facility than their counter parts. Perceived good quality of care was indicated to decrease bypassing by 63%. Likewise, availability of drugs and supplies and having information on referral procedure were shown to decrease bypassing by 68% and 80%, respectively (Table 5).

Table 5: Bivariate and multivariable analysis for factors affecting bypass status of women seeking delivery service in NEMMCS Hospital Hossana, Ethiopia, 2023

Variables		Bypassers	Non-by passer	COR(95% CI)	AOR(95% CI)	P-value
Educational status of respondents	No formal education	32	35	R		
	Has formal education	**249**	**94**	**2.8(1.69-4.9)**	**4.1(1.55-11.1)**	**0.005**
Mode of previous delivery (n = 315)	SVD	105	82	R		
	Operative delivery[a]	103	25	3.2(1.9-5.4)	2.9(0.96-9.05)	0.058
Recent pregnancy complications (n = 382)	Yes	134	42	2.02(1.29-3.16)	1.38(0.54-3.49)	0.49
	No	126	80	R		
Satisfaction by staff's treatment (n = 382)	Yes	84	55	0.48(0.31-0.75)	0.52(0.22-1.22)	0.13
	No	176	67	R		
Suffered any illness recently (n = 410)	Yes	12	16	0.31(0.14-0.68)	0.22(0.01-2.9)	0.25
	No	269	113	R		
Perceived Service quality (n = 162)	**Good**	**27**	**37**	**0.44(0.23-0.84)**	**0.37(0.16-0.85)**	**0.02**
	Not good	61	37	R		
Distance from HC	<5 km	112	71	R		
	≥5 km	169	58	1.84	1.89	0.12
Availability of Drugs and supplies (n = 162)	**Yes**	**33**	**42**	**0.45(0.24-0.85)**	**0.32(0.13-0.75)**	**0.009**
	No	55	32	R		
Waiting time (n = 162)	≤30 min	28	43	0.33(0.17-0.64)	0.44(0.19-1.06)	0.068
	>30 min	60	31	R		
Information on need of referral letter (n = 410)	**Yes**	**86**	**68**	**0.39(0.25-0.60)**	**0.20(0.09-0.47)**	**0.000**
	No	195	61	R		

Note: [a] = operative delivery include both instrument assisted and C/S delivery, % = percentage, R= reference.

4. Discussion

Despite of improved access to PHC facilities, patients usually tend to bypass and seek care at higher facilities (Abrahim *et al.*, 2015). The current study established a 68.5% of bypass rate that is supportive of existing literatures. Bypassing in this study is as frequent as it was in Nepal (Karkee *et al.*, 2015), where authors reported 70% bypass rate. But proportion of bypassers in current study is apparently high compared to those reported from India (37.7%) and South Africa (36%). The higher proportion could have been attributed to NEMMCS hospital being the only tertiary health care centre in the area. Furthermore, the difference in

bypass definition could have contributed to higher frequency. Unlike the current study, that considered bypassing regardless of the distance, bypassing in Indian study was considered if location of the referral facility is at least 10 km away from identified nearest facility. On the other hand, the current finding is slightly lower than the one reported from Tanzania (Exavery *et al.*, 2016). This could be justified by difference in study design and number of health facilities involved in Tanzanian study. Despite the fact that there are varying degrees of bypassing in different literatures, the finding in this study appears to draw a higher concern for health care system. It, obviously, indicate that something in PHC centres makes the patients much less attractive to their service. If this is hypothetically true, it suggests that some mechanism is needed to prevent bypassing in the referral system. Most probably, it requires designing of a strict referral control for which patients are accountable. Failure to act upon such alternative solutions may impose unnecessary burden to tertiary care centres and compromise quality of health care services particularly for critical conditions.

The result of multivariable analysis determined factors that have significant association with bypass status. Accordingly, maternal educational attainment is associated with higher probability of bypassing. Consistent to our finding, Mariano Salazar et al. reported higher odds of bypassing among participants with higher level of education (Salazar *et al.*, 2016). A similar study from Kenya also revealed higher odds of bypassing among women with tertiary level of education. The report from China is also in line with our finding where the authors declared statistically significant association between higher educational attainment and higher probability of bypassing (Li *et al.*, 2021). Because education is an indicator of socioeconomic status, more educated ones will have a capacity to afford an added cost due to bypassing. In addition, educated individuals are expected to have better health literacy that make them capable of choosing health facilities based on relative quality of service. Given the clear evidence in the body of existing literatures, education affects not only choice of health facility but also affects the decision of skilled birth attendance (Bayou, 2014; Tappis *et al.*, 2016). Furthermore, there are reports from Nepal (Shah, 2016) and rural Tanzania (Kruk *et al.*, 2009) that show non-significant association between educational level and bypass status. Therefore, although the relationship between educational attainment and bypassing seems to be inconclusive, this study confidently declares positive relationship between education and bypass status.

In this study, bypassing nearest PHC facility was noted to be negatively associated with perceived quality of care at PHC facility. There is 63% (P = 0.02) less likely hood of bypassing if participants had perceived good quality of care in the nearest primary health care facilities. Published studies (Kruk *et al.*, 2009; Karkee *et al.*, 2015) are consistent and showed a decreased odds of bypassing for respondents having perceived good quality of care. Though the perceived quality of care is a sum total of multiple attributes, high technical quality was reported as main driver of bypassing (Karkee *et al.*, 2015). In alternative explanation, poor quality of care at PHC facilities discourages patients' attendance. As noted in similar Tanzanian study, bypassers were more likely than non-bypassers to perceive low quality of care at nearest health facilities (Karunaratne and Ponnamperuma, 2020; County-Kenya *et al.*, 2020). This finding remarks the role of quality care on choice of health care facility that in turn urges for strengthening of their capacity to the level of expected standard.

Likewise availability of drugs and supplies in the nearest PHC facility was suggested to be protective factor against bypassing. Women who had experienced adequacy of drugs and supplies in nearest health care facilities were 68% (P = 0.009) less likely to bypass. Findings from similar studies clearly acknowledge the role of medical supplies for retention of patients in PHC facilities. A qualitative study that explored health professionals' experience on patients' bypass behaviour established that absence of medical equipment at primary level of care was related to patients' decision to side step this facilities (Koce *et al.*, 2020). This is also consistent with the finding from Ghana (Bell *et al.*, 2020).

Awareness of women on the need to have referral letter for hospital attendance was shown to decrease bypassing, and the result is consistent with other Ethiopian study (Olani, 2015). Awareness of referral system was also indicated to decrease the likely hood of bypassing in similar African study (Rajman and Mahomed, 2019). The fact in this finding is that awareness on the referral system will affect the patient's tendency of following the prescribed pathway. In current study, where 6 out of 10 bypassers claimed to have no awareness

on the need to have referral letter, it appears to be great concern for the health care system. One reason for high frequency of unawareness could be the high patient health care provider ratio that hinders delivery of all packages of service that include health education. Consideration of this issue may help prevent bypassing that result from lack of awareness. However, because of the difference in background of study population, there is another body of literature that highlighted insignificant difference between bypassers and non-bypassers (Pillay and Mahomed, 2019).

5. Limitation of the study

Although we made maximum effort to maintain the integrity of scientific procedures, our study is subjected to certain limitations. Firstly the bypass phenomenon, in this study, is explained in light of participants' perceived degree of quality care at PHC facilities with no consideration of objective assessment. On the other hand, cross sectional nature of this study inevitably hinders establishment of cause—effect relationship between bypass status and explanatory variables. Since we conducted facility based survey, it considered participants presented during data collection period.

6. Conclusion and recommendation

Given the more specialist care at tertiary hospitals, the proportion of bypassers in current study seems significantly high. The finding appears to be a great concern for the health care system as it has direct implication on health care delivery of local facilities. In this study, bypassers are more likely educated than their counter parts. Perceived quality of care, availability of drugs and supplies at PHC facilities and having information on the need to have referral letter are factors that decrease bypassing.

Therefore, in order to ensure optimum utilization of health care and prevent bypassing, ministry of health should strengthen and improve primary health care facilities. The primary health care facilities should have adequate resources that include competent clinicians, adequate medical supplies and drugs. The health workers should educate and enhance the awareness of the community on the hierarchy of health system and referral pathway. Furthermore, another research with advanced designs should be conducted to understand the problem in detail.

Availability of data and materials

The data set used in this research article will be available from the corresponding author upon reasonable request.

Conflict of interest

The authors declared that there is no conflict of interest regarding the publication of this article.

Authors' contribution

All authors contributed to this research article from the beginning to the very end of manuscript's preparation. TT, MD made a significant contribution to the conception and selection of study design. They also played primary role in the collection, analysis, interpretation of data, writing of the report, and the preparation of the manuscript. RG, TM, WW, TG, GM have actively participated in the analysis and interpretation of data; as well as the writing of the manuscript. All authors read and approved the final manuscript.

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Appendix

English questionnaire			
Part-I: Socio-demographic information			
No	**Question**	**Response**	**Skip**
101	How old are you?	_____	
102	What is your highest level of education?	None Primary school Secondary school College / University	
103	What is your spouse's highest level of education?	None Primary school Secondary school College / University	
104	What is your religion?	Christian Muslim Other (specify)……	
105	What is your occupation?	Student Unemployed Self-employed Government employed	
106	What is your ethnicity?	Hadiya Kambata Amhara Gurage Silte Other (specify)	
107	What is your marital status?	Single Married Divorced Widowed	
108	How much is your average monthly income?	_____ETB	
Part-II: Obstetric variables			
A. Past obstetrics history			
201	How many times have you been pregnant before recent pregnancy? (Gravidity including abortion, ectopic pregnancy, still birth, died after birth and currently alive children)	Number of pregnancies _____	
202	How many times have you given birth before the recent one? (includes birth after 28 weeks regardless of the outcome)	Number of deliveries _____	
203	How many other living children do you have?	_____	
204	Where did your last delivery take place	Home Health centre Hospital Private health facility	
205	What was the mode of delivery for that previous last child?	Normal vaginal delivery Assisted vaginal delivery Caesarean section	
206	Did you have any history of medical or Obstetric complications in previous pregnancies?	Yes No	

Appendix (Cont.)

B. Recent pregnancy			
207	Was the recent pregnancy planned?	Yes No	
208	For this recent pregnancy, did you receive any antenatal care?	Yes No	If no go to Question no 216
209	If yes, where did you receive your antenatal care?	Nearest health centre NEMMCSH Private clinic	
210	How many visits did you attend ANC in the recent pregnancy?	_____	
211	How long did it usually take you to reach this facility?	_____hours?	
212	What was the average amount of time that you waited to see medical staff when you visited the facility for ANC?	_____hrs?	
213	Were you comfortable by the staff's treatment at the facility during ante natal care visit?	Yes No	
214	Were any complications detected during your pregnancy?	Yes No	
215	During ANC visit, did the care providers tell you where to go to give birth when labour starts?	Yes No	
216	Which of the following abnormalities do you have in your family?	None Twins Diabetes Hypertension Congenital abnormalities Other (specify)……	
217	Which of the following diseases do you suffer from?	None Diabetes mellitus Tuberculosis Heart disease Asthma Hypertension	
Part-III: Accessibility and functionality of the nearby PHC facility			
301	Which health facility is nearby to your home?	Health centre NEMMCS hospital	
302	On average, how far is the nearby health centre from your home?	5 Km or less 5 Km-10 Km More than 10 Km	
303	Have you ever given birth in that health centre?	Yes No	If no go to 401
304	How long did you wait between the time you first arrived at the facility and the time health provider attended you?	0-30 minutes 30 minutes-1 hour 1 hour-2 hours Over 2 hours	
305	How do you express the quality of the health service?	Good Not good	
306	Are there any charges for the delivery that one has to pay?	Yes No	

Appendix (Cont.)

307	Do you think that drugs and supplies are readily available in the facility?	Yes No	
Part-IV: Information on bypass status and its perceived reason			
308	Have you directly come to this hospital from your home?	Yes No	
309	If yes, what is your reason to bypass your nearest health centre?	Health centre is far from my home Lack of operation in the HC Lack of necessary drugs/equipment Low confidence of health workers I am not satisfied with professionals' treatment HC is not fully functional	
310	Have you been ever informed about the need to have referral letter for attendance of referral hospital?	Yes No	

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