Determinants of fully immunization among children aged 12-23 months in Ethiopia. Further analysis of the 2016 Ethiopian Demographics Health Survey

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Research article

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Abstract

Abstract Background: Immunization has become the most effective public health measure for the control vaccine preventable disease. It can avert 2 to 3 million children deaths annually. Eighty eight percent of under one year children received diphtheria-tetanus-pertussis in 2015, however still an estimated 19.4 million infants worldwide missed out on basic vaccines. This analysis aims to identify determinant factors for fully immunization among children aged 12-23 months in Ethiopia. Methods: The analysis done based on 2016 Ethiopian Demography and Health Survey. Total of 2004 children aged 12-23 months recruited for this analysis. Descriptive analysis done to characterize the study participants. In addition, binary and multivariable logistic regression analysis done to identify determinants of fully immunization among children. All analysis was done using STATA. Result: Fully immunization coverage among children was positively associated with children of mothers had primary (AOR=1.73,95%CI:1.13,2.65) and secondary (AOR=2.79,95%CI:1.11,7.02) education level, at least one ANC visit (AOR=2.28,95%CI:1.47,3.52), live in Dire Dawa city administration (AOR=2.45,95%CI:1.10,5.

Background

Globally child survival is increasing, but it is still remains a public health problem. According to United Nations Children's Fund (UNICEF) report, 6 million children(it was 41 death per1000 live birth) were died globally in 2016 before reaching their fifth birth day, of which 50% death were contributed by Sub- Sahara (it was 79 death per 1000 live birth). Almost a third of global and about 40 per cent of sub-Saharan Africa under-five deaths is due to Pneumonia, diarrhea and malaria. If current trends continue 60 million children under age 5 will be died between 2017 and 2030 (1). Immunization has become the most effective public health measure for the control vaccine preventable disease. It can avert 2 to 3 million children deaths annually. The expanded programme on immunization (EPI) is one child health program established by world health organization (WHO) in 1974 to control vaccine preventable disease (2, 3). Immunization coverage of DPT3 used as a major indicator of the country's capability providing immunization service and has increased in the last years. In 2000 diphtheria-tetanus-pertussis (DPT3), coverage was 72% globally and it increased to 86% by 2015. As a result, the annual death number of child deaths fell from 10 million in 2000 to 6 million in 2015. However, still an estimated 19.4 million infants worldwide missed out on basic vaccines in 2015. About two-thirds of children none-immunized live in Ethiopia, Angola, India, Indonesia, Iraq, Nigeria, Pakistan, Philippines, Ukraine and democratic Republic Congo(1, 4). Barriers for full immunization coverage have been explored as, household Wealth index (5, 6), mother's occupation (6, 7), Educational status of mothers(5), History of antenatal care(8), Educational level(8) and place of delivery place(8). According to Andersen behavioral health model, full immunization coverage of the children is associated with external environment (region, residence), predisposing characteristics such as demographic (child's sex, family size, marital status, mother's age, birth order), social structure(parent's education and occupations), and health belief (mother's exposed to media and tobacco use history), enabling resource (ANC, PNC, place of delivery, distance to health facility, decider of mother's) (9).

When come to Ethiopia, infant and under five mortality rates are slightly higher. According to 2000 Demographic Health Survey (EDH) for Ethiopia, infant and under five mortality rates were 97 and 166 per 1000 live birth respectively. It reduced to 48 and 67 per 1000 live birth in 2016(10, 11). In Ethiopia vaccine preventable disease accounts large proportion for under five deaths. About 52% of under five deaths contributed by pneumonia (28%), diarrhea (20%) and measles (4%)(12). The Ethiopia EPI program was launched in 1980 with the goal of achieving 100% vaccination coverage for all under two years of age by the year 1990. However, in 1986 the target age group was changed to infants less than one year of age. Until 2007 the EPI program included six antigens namely Bacillus Calmette-guerin (BCG), DPT, polio and measles. Hepatitis B(HeB) and Haemophilus influenza type B (Hib) vaccine were added in 2007 to standardize EPI schedule thought the introduction of penta-valant (DPT, HeB and Hib) vaccine with support of from Global Alliance for Vaccine and Immunization (13, 14). The government of Ethiopia has made encouraging promotion , prevention and health service utilization by introducing of health extension workers (HEWs) at community level, who has be strengthening by establishment of health Development army (HDA) in 2005(15). However the immunization coverage among children aged 12-23 months is still low, accordingly 2016 Demographic Health Survey(EDHS) for Ethiopia, only 39% of national wide, children aged 12-23 months were fully immunized(one dose of BCG, three doe of penta-valant and polio, one dose of measles vaccine received before one year of age) and immunization coverage by DPT3 was 53% , has not been completed in Ethiopia as planned (10). Pneumococcal (pcv10) and rota-virus vaccine were introduced in 2011 and 2013 respectively to reduce child death due to pneumonia and diarrhea. Moreover, the revised 2015 immunization implementation guideline has planned to introduce Inactivated Polio Virus (IPV), measles-rubella, meningitis and yellow fever vaccines for less than one year children in the time between 2015 and 2020. The primary objective of this strategic plan is to achieve at least 90% national coverage and 80% in every district with all vaccines by 2020(16).

Table1. Currently available vaccine in Ethiopia and their schedule.

Age/time given	Visit	antigens
Birth	1	BCG, OPV0
6weeks	2	DPT-HeB1,OPV1,PCV1,Rota1
10 weeks	3	DPT-HeB2,OPV2,PCV2,Rota2
14 weeks	4	DPT-HeB3,OPV3,PCV3, IPV
9 Months	5	Measles

The country's immunization schedule for the above listed vaccines strictly follows the WHO recommendations for developing countries. Surveys in Ethiopia reported that full immunization coverage among children below one year is low (10, 11). But studies to identify determinants of full immunization coverage in national level are limited. Therefore, this analysis was done to identify factors associated with full immunization coverage among children aged 12-23 months in Ethiopia.

Methods

Study setting

Ethiopia is found in the horn of Africa and at present Ethiopia is administratively structured into nine regional states-Tigray, Affar, Amhara, Oromiya, Somali, Benishangul-Gumuz, Southern Nations Nationalities and Peoples (SNNP), Gambela, and Harari—and two city administrations, that is, Addis Ababa and Dire Dawa Administration Councils.

Study design and period

The analysis was based on 2016 Ethiopian Demography and Health Survey (EDHS). The EDHS cross sectional survey was conducted from January 18, 2016 to June 27, 2016. It was implemented by the Central Statistical Agency (CSA) at the request of the Federal Minister of Health (HMOH). The EDHS conducted mainly to assess 12 objectives, of which child immunization is one objective of 2016 EDHS. ICF provided technical assistance through the DHS program, which is funded by the United States Agency for International Development (USAID) and offers support and technical assistance for the implementation of population and health survey in countries worldwide

Sampling technique and process

The 2016 EDHS was used a two stage stratified cluster sample technique to ensure the national representativeness. Ethiopia has 9 regional administrative and 2 city administrative. Initially each region was stratified in to urban and rural areas. Each stratum was subdivided into districts and each district was divided into kebeles (the smallest administrative unit in Ethiopia). Finally each kebele subdivided in enumeration areas. A total of 645 enumeration areas(202 in urban areas and 443 in rural areas) were selected with probability proportional to enumeration are size based on based on the 2007 the Ethiopia population and housing census. A household listing operation was carried out in all the selected enumeration area from September to December 2015. To minimize the task of household listing each enumeration area selected for the 2016 was segmented. Only one segment was selected for the survey with probability proportional to segment size. Household listing was conducted only in the selected segment that is a 2016 EDHS cluster is either an enumeration area or segment of an enumeration area. Data/information about immunization was obtained in three ways: Written vaccination records (including the infant immunization card and other health cards), mothers' verbal reports and health facility records. For each child aged 12 -23 months during data collection period, mothers were asked to provide information about the vaccinations her child has received. A separate team visited the health facility to collect complementary immunization records if the mother was not able to present the infant immunization card and the child had visited a health facility. Consent was obtained from mothers prior to contacting the facilities and verifying child vaccination records. The purpose of obtaining information at the health facility was to complement the information collected by mother's recall (17). In this analysis 2004 children aged 12-23 months were included.

Operational definition

Fully immunization: According to EDHS, children aged 12-23 considered as “fully immunized” if they received one dose of BCG, three doses of DPT-HeB-Hib, three doses of polio(excluding of polio zero) and one dose of measles vaccine.

Not fully immunization: children aged 12-23 considered as “not fully immunized” if they missed one or more of basic vaccine (one dose of BCG, three doses of DPT-HeB-Hib, three doses of polio and one dose of measles vaccine) or unknown vaccination status.

Variables

Outcome variable

Fully immunization

This dependent variable obtained by re-coded of each vaccine (one dose of BCG, three doses of DPT-HeB-Hib, three doses of polio and one dose of measles vaccine) in to “0” and “1”. Vaccination date on card, reported by mother, and vaccination marked on card response categories coded as “1” (received vaccine) and don't know and no response categories coded as “0” (not received vaccine). Then added all received and not received scores and labeled as immunization status. The immunization status again coded as “1” if the child had received all doses of vaccinations and categorized as fully immunized and “0” if the child had missed one or more dose and don't know immunization status and categorized as not fully immunized.

Independent variables

Residence, region, parent's characteristics(age of mother, education status of mother's and father's, occupation of mother's and father's, families exposed to media, tobacco use history and marital status), family size, number of live children, wealth index of family, place of delivery, history of antenatal care (ANC) and postnatal care (PNC), mother received tetanus toxoid (TT), distance to health facility, type of fuel cooking, time to reach to water source, decision maker for health cares, number living under five children, sex of children, birth order and perceived size at birth were included in the analysis.

Statistical analysis

Data analysis was done using STATA. The data was weighted to adjust for over sampling or under sampling and non-response. In addition, complex survey analysis techniques was used when computing odds ratios since DHS used a two stage stratified sampling technique.

Correlation between independent variables was checked before fitting the final regression model. When two independent variables were found correlated, one was dropped. For each independent variable don't known status was considered as missed. Both univariate and multivariable logistic regression analysis was used to identify factors associated with fully immunization among 12-23 months aged children.

Results

Socio-demographic characteristics of mother s and children

From the total children (2004), 774(38.6%) were full immunized (received one dose of BCG and measles, three doses of DPT-HeB-Hib and polio). The proportion of fully immunization among children from urban was 65%, whereas among rural children was 35%. Above Four-fifth (81.7%) of children among whose mothers' work professional were fully immunized, whereas children whose mothers' work agriculture, 44.7% were fully immunized. The highest proportion of fully immunization was reported in Addis Ababa (89.2%) following by Dire dewa (75.9%) and Tigray (67.3%) and the lowest proportion was reported in

Afar (15.2%), Somalia (21.8%) and Oromia (24.7%) regions. The proportion of fully immunization among children from rich families was 52.6% and among children from poor families was only 29.2%. Coverage of fully immunization among children whose mothers never married was one-fifth (21.7%) which was lower compared to children whose mothers married (39.3%). Almost half (46.5%) of children among whose families have radio and or television were fully immunized and among children whose families didn't have radio and or television were 35.3%.

Half of children (50.8%) among whose mothers orthodox were fully immunized and one-fourth (26.5%) of children from whose mothers Muslim were fully immunized.

Two-fifth children (38.9%) from whose mothers didn't have a history of smoking were fully immunized were as among children whose mothers had a history of smoking were 5% only fully immunized.

Children from whose fathers' had professional work, 64% were fully immunized and children from whose fathers' didn't have work, only 23.5% were fully immunized. For further information see table2.

Maternal and child characteristics

The proportion of fully immunization among children whose mothers had at least one ANC visit were 50.7%, whereas among children whose mothers didn't have ANC visit were 18.6%. Fifty percent of children among whose mothers received TT2⁺ before birth were fully immunized and among children whose mother didn't receive tetanus toxoid, fully immunization coverage was 26%. See table 3 for further information.

Factors associated with fully immunization among children aged 12-23 months.

On bi-variable analysis fully immunization was associated with, residence, region, distance of health facility, type of cooking fuel, parents characteristics (mother and father occupation educational status of mother), religion, number of live children, at least one ANC visit, at least one PNC visit within 2 weeks after delivery, birth order, exposed to media, smoking history, decision maker for health care's and place of delivery at p value ≤ 0.20 . On multivariable analysis variables such as region, ANC follow, religion up and mothers educational level were significantly associated with fully immunization at p value ≤ 0.05 (see table 4).

Table2. Sochio demographic characteristics of mother s and children aged 12-23 months and fully basic immunization coverage in Ethiopia (n=2004).

Variables	Category	Fully immunization (%)	Variables	Category	Fully immunization (%)
Residence	Urban	64.6	Religion	Orthodox	50.8
	Urban	35.2		Catholic	36.0
Age of mother	15-19	37.9		Protestant	44.9
	20-24	38.0		Muslim	26.5
	25-29	44.1		Traditional	0.0
	30-34	35.1		other	0.0
	35-39	33.5	Mother's educational Status	No education	30.9
	40-44	34.1		Primary	46.1
	45-49	57.4		Secondary	69.6
Region	Tigray	67.3		Higher	71.8
	Afar	15.2	Family exposed to media	No	35.3
	Amhara	46.4		yes	46.5
	Oromia	24.7	Decision maker for health care's	Mother	41.9
	Somalia	21.8		Mother with husband	40.2
	Beshangul	57.4		Husband	33.3
	SNNPR	46.9		others	95.1
	Gambela	41.1	Husband's education	No education	31.5
	Harari	42.2		Primary education	41.8
	Addia Abeba	89.2		Secondary	57.1
	Dire Dawa	75.9		Higher	66.1
Marital status of respondents	Never married	21.7	History of tobacco use	no	38.9
	Married	39.3		yes	5.0
	Others*	28.8	Distance of health facility	Big problem	32.3
Mothers' occupation status	No	33.9		Not big problem	48.2
	Professional	81.9	Tine to get to water source	Premises	68.2
	Sales, clerical, services	36.5		Not premises	35.1
	Agriculture	44.7	type of cooking fuel	Electricity	75.9
	Industrial	47.4		Other	37.5
	Others	56.5	Husband occupation	No	23.5
Family wealth index	Poor	29.2		Professional	64.3
	Middle	37.1		Sales, clerical, services	45.9
	Rich	52.6		Agriculture	36.5
Family size	1-5	45.0		industrial	48.2
	≥6	32.3		Other	57.3

Key: Others*= divorce, widowed and separate

Table3. Maternal and children aged 12-23 months characteristics and fully immunization coverage in Ethiopia.

Variables	Categories	Fully immunization in %
At least one ANC visit	No	18.6
	Yes	50.7
TT vaccination before birth	Null	26.0
	One	44.4
	Two and above	50.8
At least one PNC visit	No	36.4
	Yes	64.3
Birth order	First	46.8
	2-5	40.4
	>5	30.0
Number of under five	≥4	35.6
	1-3	38.3
	0	57.5
Place of delivery	Home	29.5
	Government health facility	54.2
	Private health facility	46.3
	NGO facility	53.7
	Other	66.5
Number of live children	1-4	43.4
	≥5	29.2
Sex of child	Male	36.5
	female	40.5
Perceived size of children at birth	Small	36.9
	Average	43.0
	Large	35.9
Source of information	Mother self-report	30.3
	card	54.8

Children who live in Afar region had 81% less odds of fully immunization compared to children in Tigray region (AOR=0.19, 95%CI: 0.08, 0.46). The odds of having fully immunization among children whose mothers had at least one ANC follow up of index children was 2.60 times higher than who didn't have ANC follow up (AOR=2.28, 95%CI: 1.47, 3.52). Table 4 has more details.

Table4. Factors associated with fully immunization among children aged 12-23 months in Ethiopia

Variables	Categories	COR	95%CI	AOR	95%CI
Residence	Urban	1			
	Rural	0.3	0.17, 0.54	--	
Region	Tigray	1		1	
	Afar	0.09	0.04,0.20	0.19	0.08, 0.46*
	Amhara	0.42	0.24, 0.75	0.59	0.30, 1.16
	Oromia	0.16	0.09, 0.27	0.34	0.19, 0.61*
	Somalia	0.14	0.07, 0.27	0.41	0.18, 0.91*
	Bishangul	0.66	0.37, 1.18	0.96	0.50, 1.82
	SNNPR	0.43	0.25, 0.74	0.70	0.37, 1.31
	Gambela	0.34	0.18,0.67	0.47	0.23, 0.95*
	Harari	0.35	0.19, 0.67	0.56	0.27, 1.16
	Addis Abeba	4.03	1.95, 8.33	2.69	0.77, 9.40
	Dire Dawa	1.53	0.76, 3.07	2.45	1.10,5.46*
Distance of health facility	Big problem	1			
	Not big problem	1.95	1.46, 2.61	--	
type of cooking fuel	Electricity	1			
	Other	0.19	0.08, 44	0.11	0.02, 0.48
Mother's education	No education	1			
	Primary	1.91	1.42, 2.57	1.73	1.13, 2.65*
	Second	5.34	2.73, 10.40	2.79	1.11, 7.02*
	Higher			1.64	0.38, 7.01
Mother's occupation	Not paid	1			
	Paid	1.55	1.16, 2.08	--	
Husband occupation	Not paid	1			
	paid	2.25	1.27, 3.97	--	
Family size	1-5	1			
	≥6	0.61	0.46, 0.80	--	
Mother's smoking history	No	1			
	yes	0.08	0.02, 0.34	0.11	0.02, 0.48*
At least one ANC visit	No	1			
	Yes	4.51	3.04, 6.71	2.28	1.47, 3.52*
Place of birth	Home	1		1	
	government			1.30	0.83,2.00
	Private			0.36	0.08, 1.53
	NGO			0.40	0.04, 4.40
	Other			3.68	1.23,11.01*
Family exposed to media	no	1			
	yes	0.41	0.20, 0.83	--	
At least one PNC visit	No	1			
	yes	3.00	(1.78,5.06)	---	
Birth order	First	1			
	1-5	0.77	0.55, 1.08		
	≥6	0.49	0.33, 0.72		
Decision maker for health care's	Respondent	1		--	
	Respondent with husband	0.94	0.66, 1.33	1.03	0.64, 1.66
	Husband	0.71	0.46, 1.09	0.84	0.46,1.55
	Other	26.93	3.82, 189.94	7.88	1.09, 56.78*

Source of information	Mothers 'self-report	1	
	card	1.63	1.07, 2.50*

Key *=variables associated with fully vaccination at multi-variable analysis

1=reference and --=not associated at multiple analysis.

Discussion

Ethiopia was planned to achieve at least 80% of immunization coverage in all district by the year 2015(16). However the immunization coverage among children aged 12-23 months is still low, accordingly 2016 Demographic Health Survey(EDH), only 39% of national wide, children aged 12-23 months were fully immunized (one dose of Bacillus Calmette-guerin(BCG), three dose of penta-valant and polio, one dose of measles vaccine received before one year of age) and immunization coverage by DPT3 was 53% , has not been completed in Ethiopia as planned (10). This analysis was aimed to identify the barriers for full immunization in Ethiopia based on national wide survey data. Binary and multiple analysis was done to identify the factors associated with fully immunization. This analysis revealed that there were significant regional difference in full immunization coverage in Ethiopia. The odds of having fully immunized children among who lived in Afar, Somlia, Gambella and Oromia regional administration, were less likely compared to children in Tigray regional administration. Conversely, the odds of having fully immunized children among who lived in Dire Dewa city administration were 3.5 times higher compared to Tigray regional administration. The association between region and fully immunization is consistent with other study in Ethiopia (18). This finding is also consistent with the synthesis of DHS data in Pakistan and Mozambique (5, 9, 19). The reason, have very low routine immunization coverage might be most people at those areas (Afar, Somlia, Gambella and Oromia regional administration) are nomadic. It is obvious that in the area people live sparse and nomadic way the health infrastructure is weak and health service coverage is low. So in these regions eligible children most likely lived in remote areas without access to health services. Whereas in Dire Dewa city administration health service coverage is high, women are more educated, have different media access and better awareness about immunization.

The odds of having fully immunized children among whose mothers had primary education and secondary level were 1.7 and 2.8 times higher respectively compared to children whose mothers not educated. The finding of Fully immunization associated with mother's education is consistent with a study done in Ethiopia (20). The association between maternal education and fully immunization also consistent with other studies done out of Ethiopia, in Senegal(8), Congo (21), Nigeria(22), Pakistan (5, 9), Philippines(23), Greece(24) and Lome(25).

This could be explained that educated mothers are generally more aware of the importance of available health and immunization service, have better communication skill and tends to better utilize available service. Educated mothers using very simple language and understand easily the information found on immunization cards. Due to this literate mothers having better knowledge of vaccine preventable disease and recognizing the importance of immunization (5, 17, 26, 27). Mother's low education may influence

her general health literacy and lessen their ability to properly understand the benefits of timely and complete immunization (20, 23).

From this analysis 63% of mothers or respondents were not educated. Therefore, the policy-maker should assess the obstacles of girls or women obtaining of education access in Ethiopia to solve educational or literacy related problems. Develop strategies' to increase educational access (increase the number of school, community awareness about female education, preventing child labor and early marriage etc) The odds of having fully immunized children among whose mothers who had at least one ANC follow up were 2.3 times higher compared to whose mothers who didn't have ANC follow up. The association of fully immunization with ANC service is consistent with other study done in Ethiopia (18). This finding also consistent with other studies done in Congo(21), Senegal(8) Nigeria(22) and Philippines(23). ANC visits may be important signal to show mothers, ready access to a health facility (a short distance from a health facility, or having transportation options). It is possible that increase contact with health facilities during pregnancy, could cause of good information toward vaccination. Increased contact with the healthcare providers for obtaining of ANC improve the full immunization rate of children because mothers would have more opportunity to be informed about child health including full immunization. Furthermore, important information received by mothers during ante natal promote health care utilization of institutional delivery, post-natal care and immunization service. This might be equipped mothers with the necessary knowledge on child vaccination (23, 27, 28). This analysis revealed that 37% of mothers didn't receive antenatal care service during the index child. So the Ethiopian ministry of health, should assess the difficulties of receiving of antenatal care and develop strategies to increase antenatal care service (improve accessibility of health facility by increase number of health facilities and compassion health care providers, free public transportation for pregnant and laboring women), which may increase the institutional delivery and child immunization coverage.

The odds of having child fully immunized children, among whose mothers had a history of smoking, were 89% less likely compared to mothers didn't have a history of smoking.

This could be explained as good relationship among providers and mothers is very important for adherence of vaccination service. However, smokers experienced with emotional behavioral problems than of non-smokers, and they are rule bakers. This might be a reason to drop the immunization services(29). On the other hand, information and knowledge about immunization is important things to use vaccination service. However, health and information seeking behavior among smokers are low(30). As this analysis revealed, fully immunization was associated with source of information about vaccination history. The vaccination card is a paper used to record and track vaccination coverage. In this analysis immunization card available was only 34%. The odds of having child with fully basic immunization among children whose mothers showed the vaccination card during interview were 1.6 times higher compared to children whose mothers verbally reported. The association between source of information from card and fully immunization is consistent with other studies (18, 25, 31). This could be explained that as mothers might be equipped with the necessary information about immunization and the purpose kept immunization card. Kept the immunization card indicates they gave attention to immunization or had awareness about immunization. In this analysis most educated mothers Education kept their child immunization cards. Literate mothers having better knowledge of vaccine preventable

disease and recognizing the importance of immunization(26). From this analysis Place of delivery and decision maker for health care were positively associated with fully immunization.

Conclusion and recommendation

Fully immunization coverage among children was positively associated with children of mothers had primary and secondary educational level, at least one ANC visit of index child, live in Dire Dewa city administration and source of information from card. However, fully immunization status negatively associated with children of mothers had smoking history, live in Afar, Somlia, Gambella and Oromia regional administration. Encourage women education, antenatal care use, keep the immunization card and avoid smoking. At the area of pastoralist and sparse population the government should be considered other than the traditional static and outreach strategy. To ensure timely and complete immunization encourage the use of mobile and mass immunization strategy to reach children whose families are mobile and those in hard to reach area with immunization service.

Abbreviations

ANC-antenatal care

BCG- Bacillus Calmette-guerin

DPT- diphtheria-tetanus-pertussis

EDHS-Ethiopian Demographic Health Survey

EPI- expanded programme on immunization

HeB- Hepatitis Band

Hib- Haemophilus influenza type B

IPV- Inactivated Polio Virus

Pcv10-Pneumococcal

PNC- postnatal care

SNNP- Southern Nations Nationalities and Peoples

TT- tetanus toxoid

UNICEF- United Nations Children's Fund

Declarations

Ethical approval

The ethical approval for this study was obtained from ICF. The Institutional Reviewed Board (IRB) approved the procedure for demography health survey public-use datasets, don't allowed respondents and household identifier information. The EDHS 2016 was conducted by the Central Statistical Agency (CSA) at the request of the Federal Minister of Health (HMOH) of Ethiopia collaborated with other supporters, which is freely available online and we start download and analysis, after we received permission letter to do it.

Consent to publish

Not applicable

Data availability

The DHS analyzed during current study are available in the repository, (<https://dhsprogram.com/data>)

Competing of interest

The author declare that they have no competing interests.

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Author contributions

Conceived and designed the analysis: MBA. Performed the analysis: MBA, GAF, DN and GWD. Wrote the paper MBA, GAF, DN and GWD. Manuscript preparation: MBA, GAF, DN and GWD. Both authors approved the final version for publication.

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