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Factors Associated with Access to Under-Five Immunization Usage by Mothers in Ota, Ogun State, Nigeria

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Abstract

The paper examined factors associated with mothers' access to under-five (U5) immunization use in the study area. The study used a 2017 cross-sectional survey on child morbidity and survival data. This study was based on cross-sectional hospital-based survey data, and 1350 pregnant women who attended antenatal care, including immunization clinics for their children, during the survey period were interviewed. A multi-stage sampling technique was deployed in the design to select the respondents. The study obtained information from the respondents on demographic characteristics, immunization, and quality of healthcare services. The linear regression results showed that the place of delivery ($p = 0.000$), who assisted the respondents on the delivery of last child ($p = 0.002$), who takes care of the child in respondents absence ($p = 0.000$), birth spacing between last child and present pregnancy ($p = 0.000$), type of household waste disposal practice ($p = 0.000$) and knowledge about child preventable diseases ($p = 0.000$), are significant to the outcome variable, the immunization standing of last-child, a proxy dependent variable for child immunization status. The study recommends health education for stakeholders and retraining for healthcare workers to provide better quality child immunization services in the study area.

Keywords: under-five mortality; childhood immunization; healthcare workers; health behaviors; health facilities

1. Introduction

Childhood immunization rates in many sub-Saharan African (SSA) countries have stagnated, trailing behind other global regions despite the enormous benefits of immunization [1–3]. Nigeria has one of the worst under-five mortality rates and poorest immunization coverage in sub-Saharan Africa (SSA). The 80 percent immunization coverage of the 1980s against significant childhood killer diseases [4] has drastically nosedived to the lowest level despite all the available efforts, a point of grave concern and unacceptable. It has been reported that about 60% of non-vaccinated children live in 10 countries, including Nigeria [5,6]. Many reports observed that Nigeria holds a large share of the burden of zero-dose and under-immunized children, with an estimated over 2.3 million [7–9]. The paper examined factors associated with mothers' access to under-five (U5) immunization use in the study area. Immunization is crucial for U5 survival and is incidentally low in SSA [1,10]. This could be due to many factors leading to millions of preventable deaths annually [11–16]. Nigeria is not doing well on this front and has very high infant mortality (58 per 1000 live births) and child mortality (132 per 1000 live births) [17,18]. Nigeria's health outcomes or indicators are still unacceptably high, and many of its health facilities are not functional due to a lack of equipment, essential supplies, and qualified staff [19]. Most of the available health facilities lack resources and infrastructure, including

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cold chain facilities, medicines, deliverables, and skilled personnel, among other health facilities' necessities [20–24], thereby aggravating the risk for various health problems and leading to inadequate service provision, dismal maternal and child health indices. More worrisome about this depressing performance is the poor funding by the government, which constitutes a massive hiccup in the campaign against immunization coverage. Nigeria has a very low coverage rate of childhood vaccines worldwide and the highest number of children who have not received any vaccines in Africa [14,18], leading to more than 1 in 8 children in Nigeria dying before their fifth birthday [18].

The importance of immunization is widely known, yet its coverage in Nigeria has remained very poor despite many programs implemented to improve coverage. Perhaps the factors affecting immunization and their dynamics are yet to be fully understood, leading to their unhindered influence on the health behavior of women and the immunization status of children in Nigeria [7,25,26]. Given the above narratives, this study examines factors influencing the use or access to immunization of U5 children by their mothers among the study communities in Ota, Nigeria, with a view to upscaling use, strengthening immunization policies and service delivery through evidence-based informed intervention strategy to boost uptake and sustainability of immunization coverage.

2. Methodology

Ado-Odo/Ota (AOO) served as the study location, and it is one of the 20 Local Government Areas (LGAs) in Ogun State, Nigeria. According to the 2006 Nigeria Census figures, AOO has the second-largest total population of 527,242, 14.05% of the state's population [27], and is the industrial base of the state. However, the healthcare situation is not different from that of the country, which is perilous. The study used a 2017 cross-sectional survey on child morbidity and survival data centered on cross-sectional hospital-based survey data by the Covenant University Public Health and Wellbeing Research Cluster. One thousand three hundred fifty pregnant women who attended antenatal care were interviewed during the survey. A multi-stage sampling technique was deployed in the design. In the first stage, 1 LGA was purposively selected from the 20 LGAs in the state. In the second sampling stage, a systematic selection of 12 health facilities, each from the 16 wards in the study area, and where more than one health facility existed in a ward, one was selected randomly [28]. The choice of 12 facilities from the 16 accounted for 75%, statistically representative of the different characteristics of the health facilities in the LGA. The third sampling stage involved selecting clusters of women attending immunization clinics for their U5 children. The list of their children's immunization cards/immunization registers served as a sampling frame for the vaccine status of these U5 children. The survey instrument was tested with the stakeholders and validated by healthcare experts. A reliability test was conducted on the items in the questionnaire using Cronbach's Alpha technique, which scored 0.75. The study obtained information from the respondents on demographic and socioeconomic characteristics, health-seeking behaviors, and quality of health services according to the study's objectives. The quantitative data were analyzed with the aid of SPSS.

3. Results

The study revealed that most respondents were aged 30 or below (62.3%) and had their first child on or before age 30. However, a substantial proportion (37.7%) had children between 31 and 40. They were mainly Christians (71.5%), and the majority of the respondents had secondary (39.6%) or post-secondary (24.9%) and professional (22.9%) education. On consideration of the occupation of the respondents, it was revealed that self-employed accounts for the highest (46.4%), followed by public servants (13.6%) and private sector employees (13.1%) respectively. Those not working and trading accounted for 11.3 percent and 10.3 percent, respectively. Nevertheless, those in the farming sector (3.3%) and artisans (2.1%) followed with a negligible proportion. Room density is another aspect of the housing condition that can affect the child's health, perhaps through overcrowding, airborne infection, or even contagious diseases such as cholera. Also, the study observed that 29.2

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percent of the respondents indicated they live in a home with less than three persons, 43.6 percent reported living in homes with 3-4 persons, and 36.2 percent live in homes with five or more persons. Similarly, only a tiny proportion of the respondents (10.4%) had low environmental cleanliness and personal hygiene compared to the large number (89.6%) that maintained a clean environment and personal hygiene. Similarly, on household waste disposal, it was observed that those that disposed their waste through government collection and private agency account for the highest (57%), followed by households that practice burying or burning refuse in their compound (29.4%) and least among those that use unauthorized dumpsite (13.6%). Assistance by a skilled provider lowers the chances of complications during delivery and maintains the mother's health during pregnancy. In addition, vital information is passed on to the mothers on child care, influences future visits, use of immunization, safer sex, personal hygiene and sanitation, avoidance of unwanted pregnancy, and breastfeeding options. Information on who assisted in delivering your last child revealed that most respondents (85.2%) were assisted by modern healthcare personnel, and a reasonable proportion affirmed the contrary. Proximity is a vital factor that encourages or discourages women from visiting an orthodox health facility. While 51.1 percent of the respondents stated that the health facility is far from their homes, 48.9 percent retorted differently. Furthermore, respondents who were delayed for less than 60 minutes before obtaining treatment from health facilities when their children were ill account for 44.1 percent, and those who were delayed for 61 minutes to 120 and 121 and above before being attended to when their children were ill account for 26.1 percent and 29.8 percent, respectively.

Table 1. Socio-Demographic Factors and Related Maternal and Child Health Characteristics.

Variable	**No –1350 (100.0)**	**Percentage**	**Variable**	**No – 1350 (100.0)**	**Percentage**
Age			**Religion**		
20-24	303	22.4	Christianity	965	71.5
25-30	537	39.8	Islam	365	27
31-40	477	35.3	Traditional/Others		20
41 and above	33	2.4	1.5		
Education			**Occupation**		
No Education	63	4.7	Not Working	152	11.3
Primary	107	7.9	Self-employed	626	46’4
Secondary	535	39.6	Civil/Public Servant	183	13.6
Post-secondary	336	24.9	Private Sector	177	13.1
Professional	309	22.9	Farming	44	3.3
			Trading	139	10.3
			Artisan	29	2.1
No of Persons living in the House			**Maintaining a Clean Environment and Personal Hygiene**		
< 3 persons	272	29.2			
3-4 persons	589	43.6	Yes	1209	89.6
5 persons and above		489	No	141	10.4
36.2					
Who Assisted in the Delivery of Your Last Child			**Distance to Health Facility**		
Modern Personnel	1150	85.2	Far	690	51.1
Non-Modern Personnel	200	14.8	Not Far	660	48.9

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Time Needed to Obtain Treatment for Child at Health Facility			**Who takes Care of the Last Child in your Absence**		
< 31 minutes	168	12.4	House Help	358	26.5
31-60 minutes	428	31.7	Day-care Center	119	8.8
61-120 minutes	352	26.1	Mother/Mother-in-law	659	48.8
121 and above	402	29.8	Husband	214	15.9
Ever Used ORS			**Knowledge about Child Preventable Diseases**		
Yes	626	46.4	Yes	889	65.9
No	724	53.6	No	461	34.1
Place of Delivery of Last Child			**Major Water-related Ailments that Children Suffer**		
PHC/Hospital	546	40.4	Typhoid	542	49.1
Private Clinic	500	37.0	Cholera	79	5.9
Home	90	6.7	Dysentery	98	7.3
Traditional birth Attendant's Place	214	15.9	Diarrhea	523	38.7
			Others	108	8.0
Birth Spacing between the last Child and the present Pregnancy			**Immunization of the Last Child**		
			Complete	785	58.2
< 12 months	495	36.7	Not Complete	370	27.4
13 - 24 months	337	24.9	No Immunization	195	14.4
25 months	518	38.4			
No of Times Last Child Fall Sick in a Month			**Behavior of Health Workers at Health Facilities**		
Once	526	39.0			
Twice	78	5.8			
Thrice	390	28.9	Cordial	848	62.8
Fourth +	356	26.3	Not Cordial	502	37.2
Who Decides a Child's Place of Treatment?			**Cost of Treatment at Health Facility**		
Husband	854	63.3	Expensive	498	36.9
Myself	392	29.0	Moderate	511	37.9
Parents	65	4.8	Cheap	341	25.2
Others (Relatives, friends)	39	2.9			
No of Months used to breastfeed the last Child			**Ever lost a Child aged 1-5 years in the last year**		
< 6 months	333	24.7	Yes	265	19.6
6 – 9 months	578	42.8	No	1085	80.4
10 – 12 months	222	16.4			
12 months	217	16.1			
Type of Household Waste Disposal Practice					
Government Collection	481	35.6			
Private Agency Collection	289	21.4			
Disposal Within the Compound Via Burying or Burning	397	29.4			

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Use 13.6	Unauthorized	Dumpsite	183	

Source: Authors' Computation 2024.

Concerning childcare practice, a considerable proportion leave the care of their children to their mother/mother-in-law (48.8%) and house help (26.5%). Husbands (21.4%) and daycare centers (8.8%) followed, though daycare attendance attracted a negligible proportion. The administration of oral rehydration salt (ORS) indicates an unhealthy environment or poor water supply. While 46.4 percent administered oral rehydration salt (ORS) to their children, 53.6 percent expressed the contrary in the study area. Similarly, 65.9 percent of the respondents attested to the knowledge of child-preventable diseases, and 34.1 percent retorted negatively. In the study area, while 40.4 percent attested to giving birth to their last child in the government health facility, 37 percent gave birth at private clinics. Nevertheless, slightly above one-fifth of the respondents (22.6%) used non-institutional facilities to deliver their children. Water-related ailments showed that the highest proportion of the study population of their children suffered from typhoid (40.1%) and diarrhea (38.7%), respectively. Also, dysentery and cholera ailments were noticed among children of respondents to the tune of 7.3 percent and 5.9 percent, respectively, whereas Other related water ailments account for 8 percent. WHO recommends 24-36 months of birth spacing to reduce maternal and U5 mortality. Shorter pregnancy spacing affects the breastfeeding duration of the previous child and gives less time for maternal recuperation. In the study area, respondents who spaced their pregnancy for less than 12 months accounted for 36.7 percent, and those between 13 and 24 months registered at 24.9 percent. Nevertheless, respondents with a birth spacing of 25 months or more accounted for the highest proportion (38.4%).

The immunization status of the last child revealed a worrisome scenario as 58.2 percent of the respondents' children received a complete immunization dosage, and 27.4 percent and 14.4 percent received incomplete and zero doses of immunization, respectively. This means that 41.8 percent of children in the study communities received no immunization. The frequency of children falling sick is a serious challenge due to the precarious healthcare system in Nigeria. In the current study, respondents whose children fell sick once, twice, and thrice accounted for 39%, 5.8%, and 28.9%, respectively. However, over one-fourth of the respondents (26.3%) affirmed their children fell sick four times a month. The behavior of health workers at health facilities could make or mar the patronage of mothers seeking access to immunization for their children. In the study area, while the cordiality of health workers accounts for 62.8 percent, a substantial proportion (37.2%) confirmed that health workers mistreated them at the time of the survey. Among the study communities, respondents established that their husbands decided on the place of treatment with an overwhelming proportion (63.3%), followed by the respondents (29%) and a negligible proportion from others (parents, relations, and friends). The cost of treatment is another hurdle at institutional health facilities, whether government or private. This is so because access to healthcare services is mainly through out-of-pocket expenditure or cash and carry in our local parlance. In the study area, 36.9 percent and 37.9 percent indicated that treatment costs are expensive and moderate, respectively, with only slightly above one–fourth (25.2%) admitting that the cost is cheap. Attitude and knowledge were likely to ignite breastfeeding within an hour after birth. Breastfeeding provides antibodies the baby needs, reduces infection, is cost-effective, and ensures mother-child bonding. Above all, improved breastfeeding practice can also positively affect birth spacing, contributing to child survival. Regarding breastfeeding, respondents who breastfed their children between 6 months and 9 months and those in the category of less than 6 months account for the highest proportion (42.8%) and (24.7%), respectively. However, respondents in 10-12 months and 12 months and above accounted for 16.4 percent and 16.1 percent, respectively. The loss of a child within this age bracket would trigger a greater reaction from the incoming child. As the saying goes, experience is the best teacher. There is a very high chance that parents who lost a child due to a preventable disease would

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not allow the same thing to happen again to their next child. Even though respondents who lost no child account for an overwhelming proportion (80.4%), those who had almost one-fifth of the entire proportion (19.6%).

The correlation coefficient (R=0.404) in Table 2 shows a positive correlation between the immunization state of the last child and its predictors on average. The R-squared indicates that the included predictor in the model explains 16.3 percent of the last child immunization status variance. The adjusted R-squared of 15.9 percent further confirms this result. The ANOVA result (F-statistic =43.557; P-value <0.01) suggests the statistical model is significant at 1 percent, indicating that the model correctly fits the data. This implies that the outcome of the predicted model result is valid, credible, and can be trusted for valuable policy recommendations. Analysis of the estimated coefficient shows that all the predictors significantly impact last immunization status at a 1 percent significance level. Those who take care of the last child in absence (-0.077; P-value <0.01) and birth spacing between last child and present pregnancy (-0.089; P-value <0.01) indicate a 7.7 and 8.9 percent negative impact on immunization. Consequently, place of delivery of last child (0.070; P-value<0.01)), who assisted in the last child delivery (0.089; P-value<0.01), type of household waste disposal practice (0.17; P-value<0.01) and knowledge about child preventable disease (0.241; P-value <0.01) all indicate a direct positive impact by enhancing immunization status by 7.0, 8.9, 7.8 and 24.1 percent respectively. However, awareness about preventable child diseases accounted for the highest positive contribution to improved immunization status.

Table 2. ANOVA showing the relationship between predictors and immunization status of the last child.

Model	R	R Square	Adjusted R Square	Std Error of the estimate		
	. 404	.163	.159	.671		
Model		Sum of Squares	df	Mean squares	F	Sig
Regression		117.635	6	19606	43.557	.000
Residual		604.513	1343	.450		
Total		722.148	1349			
Variables		Unstandardized Coefficients		Standardized Coefficients	t	Sig
		B	Std error	Beta		
(Constant)		1.225	.115		10.629	.000
Place of delivery of last child		.070	.017	.110	4.121	.000
Who assisted in the delivery of your last child		.089	.029	.082	3.055	.002
Who takes care of the last child in your absence		-.077	.019	-.110	-4.132	.000
Birth Spacing between last child and present pregnancy		-.o89	.011	-.203	-7.912	.000
Type of household waste disposal practice		.078	.017	.114	4.533	.000
Knowledge about the child preventable diseases		.241	.039	.157	6.169	.000

Abbreviations: ANOVA-analysis of variance, Std- standard, Sig-significance

4. Discussion

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Immunization protects U5 against childhood illness and is critical for places like Nigeria, with a precarious health system. So, research that will throw more light on the dynamics of causes influencing immunization usage becomes imperative in improving access to immunization among the study communities. Therefore, the need to evolve evidence-based informed studies like this is overdue. The present study revealed the relationship between selected variables related to immunization of U5 children in the study area. House density is related to overcrowding, which bears the extent of disease transmission among the vulnerable, such as exposure to infectious diseases and accidental injuries. Ideally, only 63.8 percent of the population resides in a house with four or fewer persons. However, respondents who live in a house with five or more persons account for 36.2 percent. High house density implies pressure on facilities [29,30], increased unsanitary conditions [31,32], and a high risk of contracting infectious diseases, resulting in increased mortality [33].

Similarly, only a tiny proportion of the respondents (10.4%) had low environmental cleanliness and personal hygiene compared to the large number (89.6%) that maintained a clean environment and personal hygiene. Poor environmental sanitation is critical to the survival of U5, particularly in Nigeria, where the healthcare system is precarious. In spite of the fact that a small proportion of the respondents use unauthorized dumpsites to dispose of their generated refuse, the harmful effects are more towards contamination and pollution of the environment. Assistance by a skilled provider lowers the chances of complications during delivery and maintains good health for both mother and child. In addition, vital information is passed on to the mothers on child care, influences future visits, use of immunization, safer sex, personal hygiene and sanitation, avoidance of unwanted pregnancy, and breastfeeding options. Information on who assisted in delivering your last child revealed that most respondents (85.2%) were assisted by modern healthcare personnel, and a judicious proportion affirmed the contrary. Though this is a welcome development among the study communities, there is a need to bring all communities under the same practice to accelerate total immunization coverage and ensure a high survival rate for U5 children. Proximity is a vital factor that encourages or discourages women from visiting modern health facilities. While 51.1 percent of the respondents stated that the health facility is far from their homes, 48.9 percent retorted differently. Long distances to healthcare facilities are one of the reasons for low patronage, which leads to empathy towards the immunization of children. Delays at households or health facilities are very dangerous, especially for children. Respondents who stated that they obtain treatment for their children in less than one-hour account for 44.1 percent, and those who indicated one hour or more account for 55.9 percent, respectively. Household delay in care-seeking during an emergency might be due to cultural /traditional beliefs, health-related, and socioeconomic limitations. The longer time needed to obtain treatment at health facilities attracts adverse health outcomes [34,35]. However, it has been noticed that there is a tendency to explore traditional medicine and self-treatment before turning to the biomedical care system [36], especially if hindrance factors are enormous. Another lethal practice of most respondents is the act of leaving their children under the care of outsiders, namely mother/mother-in-law (48.8%), house help (26.5%), and daycare center (8.8%), respectively. Only 15.9 percent of the child's care was attributed to the husband in the study area. While the mother/mother-in-law may not be grand in modern child care, house help, and daycare centers do not take good care of the children, and in most cases, people complain about the high frequency of missing children.

Oral rehydration solution (ORS) is one of the breakthroughs in arresting child-preventable diseases such as cholera, diarrhea, etc. Diarrhoea remains a leading cause of childhood morbidity and mortality in developing countries, including Nigeria, as dehydration caused by diarrhoea is a significant cause of illness and death among young children [18]. ORS knowledge is vital to avoid giving concoctions to children and taking native medicines, which might result in adverse consequences. While it is gratifying that a substantial proportion of the respondents (46.4%) have this knowledge, a vast number (53.6%) are not utilizing this child-saving therapy. Knowledge about the preventive healthcare of U5 aids in equipping the child with positive responses in treatment. 65.9 percent of the respondents attested to the knowledge of child-preventable diseases, and 34.1 percent retorted negatively. Mothers' health practices are crucial to a child's health status. For instance, in

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Nigeria, it has been reported that the use of health facilities for delivery (39%) and assistance by a skilled provider (43%) of births were low [18]. This scenario is dangerous and may be partly due to mothers' practices leading to poor child health care. The place of delivery is critical to child survival as skilled health providers are available to manage obstetric complications. Whereas institutional delivery is practiced by a remarkable proportion of respondents (77.4%) in the study area, slightly above one-fifth (22.6%) do not adhere to orthodox medicine among the study communities. Even though the number looks small in real terms in a place with an unsafe healthcare system like Nigeria, the consequences could be massive, as pointed out by an earlier study [37]. The source of water is crucial to water-related ailments that children suffer, particularly in semi-rural or rural areas. Among the study communities, respondents' children suffered mainly from typhoid (40.1%) and diarrhea (38.7%), respectively. In the study area, respondents who spaced their pregnancy for less than 12 months accounted for 36.7 percent, and those between 13 and 24 months registered at 24.9 percent. Even though more than half of the respondents (58.2%) had immunized their last children, incomplete and zero immunization of children by respondents accounted for a substantial proportion (41.8%). Immunization is a lifeline for children; incomplete and zero immunizations are ineffective. The non-adherence to the complete childhood immunization schedule among the study communities might be related not only to socioeconomic conditions and cultural and healthcare system characteristics but also might be due to the health providers' attitudes/practices, according to earlier studies [38–43]. The number of times a child falls sick in a month indicates the child's health status and must be taken seriously. Respondents whose children fell sick thrice or more in a month account for 55.3 percent, which is against a lower proportion (44.7%) of those under the twice category. This considerable proportion is unacceptable, especially with our dismal healthcare system.

Mothers should not wait for long before appropriate action is taken to avoid losing their children. The number of times a child falls sick in a month signifies low child healthcare and could be a product of an unclean environment, poor hygienic practices, overcrowding, inadequate waste disposal, or related ailments, among others. The relationship is highly significant and aligns with other earlier studies [44–46]. The behavior of health providers attracts institutional patronage from the public. Where there is no cordiality, patients run away. In addition to their care, human relations go a long way in ascertaining utilization. While 62.8 percent of respondents attest to the cordiality of healthcare providers, a substantial proportion (37.1%) of them stated otherwise. The decision of the child's place of treatment is the first step to the survival of the child. In the study community, husbands are the head of the family, decide where the child goes for treatment, and pay for the treatment costs. The study communities are not different from the societal practice. The respondents who stated that their husbands decided the treatment place account for an overwhelming proportion (63.3%), followed by the respondents (29%), and a negligible proportion accounts for the outsiders. Another unacceptable practice found among the respondents and health providers is the loss of time or response in treating a sick child at home or in the health facility, which should not be compromised. This is because illness is a matter of life and death, and each second counts. The cost of treatment is another hurdle at institutional health facilities, whether government or private. This is because access to healthcare services is mainly through out-of-pocket expenditure or cash at the point of service. In the study area, 36.9 percent and 37.9 percent indicated that treatment costs are expensive and moderate, respectively, with only slightly above one–fourth (25.2%) admitting that the cost is cheap. Reducing the cost of modern healthcare is a significant intervention leading to high patronage, aligning with an earlier study [47]. Breastfeeding provides antibodies the baby needs, reduces infection, is cost-effective, and ensures mother-child bonding. Above all, improved breastfeeding practice can also positively affect birth spacing, contributing to child survival. Regarding breastfeeding, respondents who breastfed their children between 6 and 9 months and less than 6 months were found to attract the highest proportion (42.8%) and (24.7%), respectively. However, respondents in 10-12 months and 12 months and above accounted for 16.4 percent and 16.1 percent, respectively. A declining incidence of breastfeeding or a less than two-year interval reduces breast milk's nutritional benefits and immunological protection, lowering the child's health status. The loss

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of a child within this age bracket would trigger a greater action on the incoming child. As the saying goes, experience is the best teacher. There is a very high chance that parents who lost a child due to a preventable disease would not allow the same thing to happen again to their next child. Even though respondents who lost no child account for an overwhelming proportion (80.4%), those who had almost one-fifth of the entire proportion (19.6%). This situation is not acceptable as it affects the joy and insurance against fertility.

5. Conclusion

Mortality, including child mortality, determines population growth, and population size fluctuates in relation to mortality. The study focused on drivers of access to immunization for U5 children. Immunization is critical in reducing child mortality and improving survival. It is also a composite index reflecting various communities' environmental, sociocultural, economic, sustainable healthcare systems, and behavioral situations. The condition of epidemic neglect reflects the growing and worsening healthcare system and the gradual reduction of the country's human development index. The linear regression revealed that the place of delivery ($p = 0.000$), skilled assistance ($p = 0.002$), who takes care of the child in your absence ($p = 0.000$), birth spacing between the last child and present pregnancy ($p = 0.000$), household waste disposal ($p = 0.000$) and knowledge about child preventable diseases ($p = 0.000$), manifest significantly to the immunization of last-child, a proxy dependent variable for child immunization status. The variance analysis (ANOVA) showed a significant relationship between the independent and dependent variables [48]. (see Table 2). The study recommends health education to stakeholders and retraining for healthcare workers for better quality delivery of child immunization services to mitigate high zero or under dose children and enhance overall immunization coverage among communities.

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Ethical consideration: The study needs no ethical approval since no human tissues, animal blood, or saliva were involved. However, verbal consent was obtained from all the respondents, and their confidentiality was assured. Furthermore, approval was obtained from the Ado-Odo/Ota Local Government and Covenant University Ota, respectively.

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