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ASSESSMENT OF IMMUNIZATION COVERAGE AND FACTORS THAT DETERMINE DROPOUT RATE AMONG CHILDREN 0- 23 MONTHS OF AGE, IN ESAN CENTRAL LGA, EDO STATE, NIGERIA

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Abstract

Vaccination is a crucial preventive measure, averting an estimated 2.5 million deaths among children under the age of five. Despite global efforts, including the immunization of approximately 116 million infants in 2018, comprising 86% of the population, vaccine-preventable diseases continue to claim over 1.5 million lives annually. This study focused on evaluating immunization coverage and identifying factors contributing to dropout rates in selected Healthcare Centers within the Esan Central Local Government Area of Irrua, Edo State.

A cross-sectional study design was employed, with 415 respondents purposively selected. Data were collected through self-administered questionnaires and analyzed using descriptive and inferential statistics. The findings revealed that the majority of respondents were aged 25-34 years (44.25%), predominantly female (94.13%), married (56.48%), and had at least attained a secondary level of education (48.6%). Furthermore, a significant portion reported being housewives (31.05%) or engaged in business (26.60%). The majority identified as Christians

(69.78%), while 31.05% practiced Islam. Regarding ethnicity, 78.24% were from the Esan tribe, while Ibos and Hausas represented 2.93% each, and other ethnicities accounted for 12.71%.

Bivariate analysis indicated associations between immunization dropout and various factors, including the child's health status during scheduled appointments (X2=10.0122, df=1, p=0.001), maternal awareness of immunization schedules (X2=29.13765, df=1, p=0.05), place of delivery (X2=78.5586, df=1, p=0.01), fear of side effects (X2=29.0515, df=1, p=0.05), poor knowledge of appointment dates (X2=18.1445, df=1, p=0.01), and financial constraints (X2=49.1877, df=1, p=0.01).

Chi-square tests revealed a level of association with a p-value >0.05, leading to the acceptance of the null hypothesis. The study concluded that immunization coverage remains suboptimal among children aged 0-23 months. Recommendations include addressing factors influencing immunization coverage to mitigate dropout rates and enhance overall immunization coverage.

Key words: *Vaccination, immunization schedules, place of delivery, fear of side effects, financial constraints*

Background to the Study

Immunization is a means of preventing vaccine preventable diseases and mortality among children less than 5 years of age, and still mothers and caregivers find it hard to complete their children immunization schedule thereby endangering the lives of these children. Immunization, defined as the process that makes a person immune or resistant to an infectious disease, typically by the administration of a vaccine, is one of the most effective interventions in contemporary public health practice (WHO, 2020, UNICEF 2020). Several cost–benefit analyses have consistently placed immunization as one of the most cost-effective health interventions with huge direct and societal benefits (Orenstein & Ahmed, 2019). According to Zhou, et al. 2019, immunization saves about 2–3million lives every year, and has successfully led to the elimination of several vaccine preventable diseases in some high-income countries, including polio, diphtheria, and Pertusis, (Greenwood; 2019: Orenstein & Ahmed, 2019). Indeed, childhood immunization has had a remarkable impact on child morbidity and mortality worldwide with immense positive multiplier effects on the larger communities (Zhou et al., 2019, Greenwood; 2019, Orenstein & Ahmed, 2019). Nigeria is one of the 10 countries (Angola, Brazil, the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Mexico, Nigeria, Pakistan, and the Philippines) that account for over 60% of the children who did not get PENTA 3 in 2019. PENTA 3 coverage is used as an indicator of how well countries are providing routine immunization (RI) services WHO, (2020).

Reaching Every Ward (REW), an approach developed in 2002 by the World Health Organization (WHO) and partners, provides a framework for strengthening National Immunization Programmes (WHO, 2019). To improve Immunization coverage, Nigeria adopted the REW strategy in 2005. The REW strategy focuses on RI in health facilities and outreaches, including components such as improved access for under-served and hard-to-reach areas; support supervision; monitoring and use of data for action; community mobilization and improving community links with service delivery. These community linkages include the Ward Development Committee (WDC)-linked to primary health care including immunization at ward level; and the Social Mobilization Committee (SMC), focused specifically on immunization at local government level. The Levels of morbidity and mortality from vaccine-preventable diseases have decreased in

recent years due to administration of childhood vaccinations. Every year, vaccination effectively prevents about 2–3 million child deaths. Nonetheless it is also estimated that vaccine-preventable diseases are still responsible for 1.5 million deaths each year among children under 5 Years of age. Previous studies have demonstrated that vaccination has a positive impact on the control of communicable diseases and decreases the number of disability- adjusted life years (DALYs) rates, (WHO, 2019)

In Nigeria, the EPI was initiated in 1978. It is one of the main sub-components of the Basic Package of Health Services (BPHS) under the main component of child health and immunization. The EPI services are provided from the Health Sub-Center (HSC) level to the Provincial Hospital (PH) level. Vaccination is provided at all public health facilities free of charge. The number of health facilities that provide vaccination services has increased from 1,575 in 2015 to 2,926 in 2018 (WHO, 2017). Nonetheless, 2.5 million deaths per year are still caused by vaccine-preventable diseases, and approximately 1.5 million of them are among children under5 Years of age in developing countries, (UNICEF, 2021). Vaccine-preventable diseases including tuberculosis, poliomyelitis, diphtheria, pertussis, neonatal tetanus, hepatitis B, pneumonia due to Haemophilus Influenzae, and measles are among the main killers of children under 5 years of age in developing countries (Meleko et al., 2020). Nigeria is taking part in the global fight against these diseases by implementing BCG, OPV, Pentavalent, and measles vaccines. Although Afghanistan did not reach its targets, coverage of Pentavalent-3, OPV, and measles vaccine was 58%, 65%, and 60% respectively, based on the 2015 AfDHS survey (Collaborators, 2019). As Stipulated by Meleko et al., (2021), despite the improvements in vaccination services over the past 40 years and the increased number of health facilities that provide vaccination services, the vaccination coverage in Nigeria has remained low due security and other related problems. A study by Farzard et al., (2019), that used the Nigeria Health Survey dataset revealed that full vaccination coverage was only 59%. Outbreaks of vaccine-preventable diseases still have a seasonal pattern in Nigeria. Understanding factors that influence vaccination coverage is important to increase the vaccination coverage rate. Numerous investigations have found that the factors influencing vaccination coverage among children include sex of child, place of birth, maternal and paternal education, maternal and paternal occupation, and numbers of Ante-Natal care (ANC) visits, household characteristics, sociocultural factors and socio-demographic factors. The present study therefore is aimed at assessing the factors that determine Immunization coverage and dropout rates among children less than 5 years of age in Esan Central LGA, furthermore inorder to achieve its main objective the study aims to evaluate the extent of immunization coverage among children aged 0-23 months in five selected wards within Esan Central Local Government Area. It also seeks to investigate socio-demographic factors associated with immunization dropout rates in the same age group and geographic area. Additionally, the study intends to determine the actual immunization dropout rates within the specified wards. also, it aims to identify and analyze the factors contributing to the immunization dropout rates among children aged 0-23 months in the selected wards. Lastly, the study aims to propose solutions for improving immunization coverage among children aged 0-23 months residing in the five selected wards of Esan Central Local Government Area.

Hypothesis

H0: There is no significant relationship between the Socio- demographic factors associated with immunization coverage and immunization dropout rates.

H1: There is significant Difference between health system factors and Immunization dropout rates.

Materials and Methods

Research Design

A community-based cross-sectional study was conducted in five selected wards in Esan Central LGA, the wards are Otoruwa 1, Otoruwa 2, Ikekato, Uwessan 1 and Uwessan 2 wards out of the ten Political wards

Research Setting

This study was carried out in five selected ward, in Esan Central local Government Irrua Edo State. Irrua is the Head Quarter of Esan Central Local Government situated in Edo Central. It has 8 Primary Health Care Facilities, 10 Comprehensive Health Care Centre's, one Model Health Care Centre, One Tertiary Institutions, 8 Private Clinics, 2 District hospitals, and numerous maternity homes. It is situated along Benin Auchi Express road.

Population of the Study

The total target population of the five (5) selected wards is 414 of children aged 0–23 months. Otoruwa 1 ward target is 117 , while Otoruwa 11 ward target population is 105, Ikekato ward target population is 86 and Uwessan 1 and Uwessan 2 are 64 ,42 respectively. During the study, the mothers/caregivers of these children were interviewed.

Sample size/ Sampling Techniques

Sample size was determined using Epi-info version 7.2.4.0 and based on the following assumptions: Precision of 5% at 95% confidence level and power of 80%. The sample size was calculated using a population of 17,222 for eligible children 0-23months. The calculated sample size is 376, a 10% non- response rate was added to derive the sample size of **414**.

Sampling techniques

The WHO EPI systematic sampling techniques will be used to select mothers/immediate caretakers of children aged 0-23 months from the five selected wards included in the study.

17,222 / 414 = 42, therefore using the sampling frame of the population of all the communities in all the selected wards as seen in table 3 below, the first household (X) will be randomly selected from Akho community of Otoruwa 1 ward, then 42 was added to the number of the household (X + 42) to get the next household and so on. This was done until a total of 414 households have been selected and visited in all the communities and wards included.

Method for Data Collection

Data was collected using a tool that was adapted from EDHS (2021) immunization questionnaire another relevant literature (Ireye et al, 2019). It was prepared in English. The questionnaire is divided into five (5) Sections namely, (A) Socio-demographic factors of mothers/caregivers, (B) Healthcare utilization of mothers/caregivers on determinants of vaccination dropout rate, (C) Immunization coverage for routine immunization, (D) factors associated with immunization dropout rate and (E) Factors associated with healthcare service utilization. One BNSc Nurse, one Public Health Nursing Officer (PHNO), one Principal Environmental Officer, two Principal Community Extension Workers, two Laboratory Scientist and one Monitoring and Evaluation officer was given one week training for data collection and were also trained on overall data collection procedures and the techniques of interviewing. Before starting the actual data collection, the questionnaire was pretested on 10% of similar respondents in four communities in Eguare ward in Esan West LGA which was included in the final study. All field staff and the principal investigator assessed the clarity and completeness of the questionnaire. The supervisor checked daily for the completeness, clarity, and consistency of the questionnaires and gave appropriate supportive supervision during the data collection process on the field.

Method of Data Analysis

The data collected was scrutinized for completeness, missing value, and inconsistencies before entry into the excel spread sheet. The data was coded and entered in Epi info version 7 statistical software. Descriptive statistics was used to analyze data using tables, bar charts and pie charts. Bivarate analysis such as chi-square test was used to determine the level of association between selected independents and dependents variables at P value <0.05

Ethical considerations

Ethical clearance was collected from the Ethical Review Committee of Esan Central LGA. A letter of permission to conduct the study was obtained from the Director Primary Health Care Department. A written informed consent was given to participants before data collection. They were informed that participation in the study was voluntary, the respondents were also informed that they had the right to withdraw from the study at any stage during the interview.

RESULTS

Table 1; Sociodemographic characteristics of the respondents

Variables	Frequency	Percentage
Age(years)		
15-24	124	30.32
25-34	181	44.25
35-44	85	20.78
45-54	19	4.65
Above 54	0	0
Sex of caregiver		
Male	24	5.87
Female	385	94.13
Age of child(months)		
0-6	84	20.54
7-10	84	20.54
11-14	39	9.54
15-18	136	33.25
19-23	66	16.14
Sex of child		
Male	195	47.68
Female	214	12.47
Educational background of caregivers		

None	50	12.22
Primary	132	32.27
Secondary	176	43.03
Tertiary	51	12.47
Marital status of caregivers		
Single	73	17.85
Married	231	56.48
Separated	77	18.83
Divorced	17	4.16
Widowed	11	2.69
Religion 0f caregivers		
Christainity	281	68.78
Islam	127	31.05
Freethinkers	1	0.24
Occupation of caregivers		
Housewife	127	31.05
Employed	58	14.18
Business	27	26.60
Daily worker	51	12.47
Farmer	146	35.70
Ethnicity of caregivers		
Esan	320	78.24
Hausa	12	2.93
Igbo	12	2.93
Yoruba	13	3.18

Socio –demographic characteristics of Respondent

Four hundred and fourteen questionnaires were given out but only four and nine were retrieved, which makes a response rate of 98.8%. As shown in table 4 5.87% of the caregivers were males while 94.13% were females. The majority of the mothers 44.74%, while 55.26% tertiary level of education. Also, majority 68.70% are Christian while 31.05% of them are Muslims. 75.00% of the households had a family size of 4 to 6 while 25.00% of the households

had a family size of one to three. Also, findings show that 89.74.0% of the respondents walk 30 minutes or less to reach the nearest health facility, while 74.82% of the mothers had at least one ANC visit during their last pregnancy.

Variables	Categories	Immunization status			Chi-square	95%CI		Df	AOR	COR	P-value
		Fully	Partial	Unimmunized		Upper	Lower				
Age of caregiver(years)	15-34	67	236	2	4.448	0.3586	0.9662	1	0.5886	0.5971	0.0349
	>35	33	69	2							
Sex of caregiver	Male	5	18	1	0.1805	0.2920	2.2101	1	0.8033	6.7901	0.6792
	Female	95	287	3							
Marital status	Married	69	161	1	8.4419	1.2510	3.2608	1	2.0197	1.1581	0.0037
	Single and others	31	144	3							
Educational level	None/primary	28	151	4	15.0083	0.2367	0.6308	1	0.3864	0.5180	0.0001
	Secon/tertiary	72	154								
Occupation	Housewife	54	217	2	9.68918	1.3039	3.2952	1	2.0728	1.1484	0.0019
	Farmers/others	46	88	2							
Religion of caregiver	Christianity	74	207	1	1.5775	0.8331	2.2906	1	1.38	0.9216	0.0019
	Islam	26	98	3							
Parity of caregiver	1-6	96	296	4	0.2903	0.2169	2.3906	1	0.7200	0.6551	0.5900
	>7	4	9								

Similarly, 79.22% of the respondents have received one or more doses of Tetanus Toxoid (TT) vaccine, while 63.33% of the mothers gave their last birth in health institutions. Additionally, 34.23% gave birth at home, while 2.44% delivered in religious homes, had postnatal checkups 61.37% and had no postnatal checkup is 38.63%. Additionally, the majority of the respondents were aged between 25 to 34 years and were from Esan ethnic group (78.24%), while Ibo and Hausa are 2.93% each while others came out second with 12.71%.

Table 2 Bivariate Association of socio demographic factors with immunization dropout

As Shown in table 2, the bivariate association of immunization dropout and socio-demographic characteristics of the respondents. It revealed that Age of the respondent

(X2=4.4487, df=1, p-value= 0.0349284), Marital status (X2=8.4419, df=1, p-value= 0.00366664), level of education (X2=15.0083, df=1, p <0.05), occupational status (X2=9.6918, df=1, p-value= pa 0.05), and religion, p->0.05), were significantly associated with immunization dropout among the respondents. Socio-demographic characteristics such as sex of the respondent were not significantly associated with immunization status of the respondents (X2=01805. f=1, p-value= p>0.05) and parity of mothers (X2=0.05 df=1, p>0.05).

Immunization coverage among children Aged 0 to 23 months

As shown in table 1, the immunization coverage of various antigens of children 0- 23 months of age was higher and Pentavalent1 antigen 87.78%. Also, 89.73% for PCV1, 80.93%, while OPV2 is 87.78%, PCV2 73.59% and Pentavalent 2 antigen is 87.78%. Also, OPV 3 87.78%, PCV 3 64.30 % and Pentavalent 3 87.78%. Respectively, Measles 1, 26.65% Measles2, 60.15%, yellow fever 55.75% and 55.75 % for Men A vaccine. IPV1 and IPV2 79.71% and 59.80% vaccine were the antigen with the lowest coverage of children aged 0- 23 months.

Chart showing fully immunized children 0- 23 months of age in Esan Central LGA

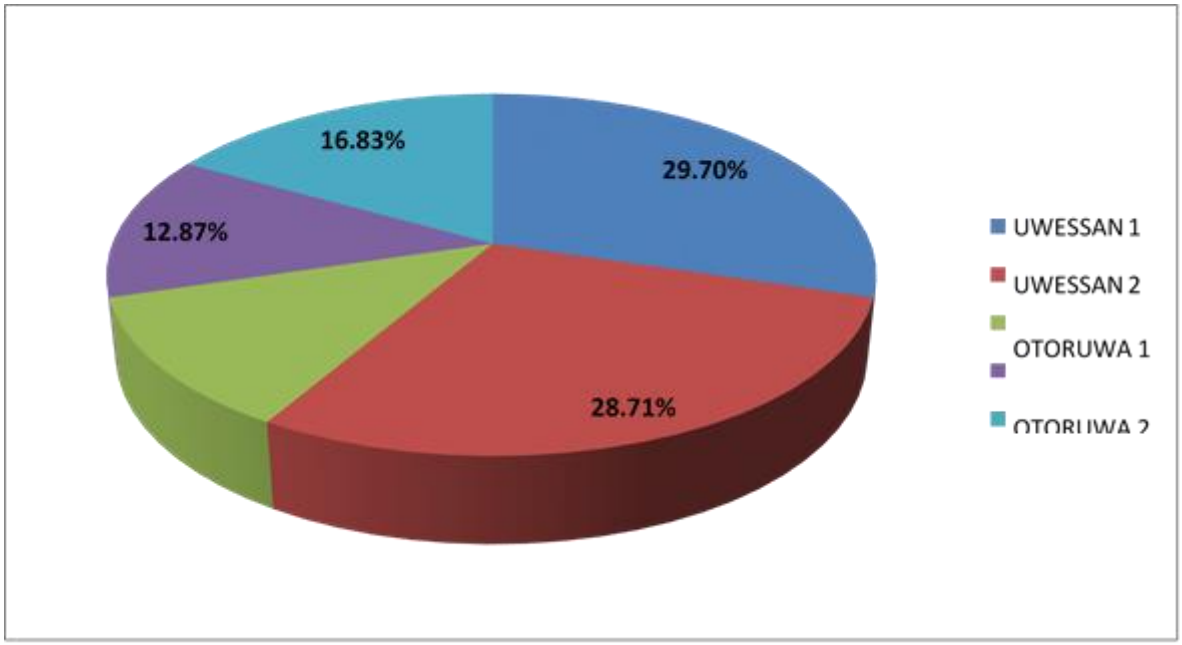

Fig 1: The figure above shows that Otoruwa 1 ward had highest proportion of fully immunized children with (41%), followed by Otoruwa2 ward with (24%)of children fully immunized and Uwessan 1 ward with the least of (5%).

Table 3

RI antigen	**Frequency**		**Coverage(N=409)n(95% CI)**	**Dropout(%(95%CI)**
At birth	**Yes**	**No**		
BCG	405	4	99.02(97.51-99.62)	0.98(0.38-2.49)
OPVO	359	50	87.78(84.24-90.60)	12.24(9.40-15.76)
HBVO	336	73	82.15(78.15-85.56)	17.85(14.44-21.85)
AT six weeks				

OPV1	391	18	95.60(93.15-97.20)	4.40(2.80-6.85)
PENTA1	390	19	92.86(95.35-97.01)	4.65(2.99-7.14)
PCV1	367	42	89.73(86.41-92.31)	10.27(7.69-13.59)
IPV1	323	86	78.97(74.76-82.64)	21.03(17.36-25.24)
Ten weeks				
OPV2	359	50	87.78(84.24-90.60)	12.22(9.40-15.76)
PENTA2	359	50	87.78(84.24-90.60)	12.22(9.40-15.76)
PCV2	331	78	80.93(76.84-85.44)	19.07(15.56-23.16)
Fourteen weeks				
OPV 3	321	88	78.48(74.50-82.42)	21.52(17.58-25.50)
PENTA3	321	88	78.48(74.50-82.42)	21.52(17.58-25.50)
PCV3	300	109	73.35(69.12-77.63)	26.65(22.37-30.88)
IPV2	242	167	59.17(54.34-63.83)	40.83(36.17-45.66)
Nine months				
Measles1 supplements	108	301	64.06(59.55-68.79)	35.94(31.21-40.45)
Men A	227	182	55.50(50.90-60.48)	44.50(39.52-49.10)
Yellow fever	245	164	60.59(55.33-64.78)	40.10(35.22-44.67)
Fifteen months				
Measles 2 supplement	108	301	26.41(22.60-31.14)	73.51(68.86-77.40)
Vit A(6-11mths)	246	163	60.15(55.33-64.78)	39.85(35.22-43.44.67)
Vit A(12-23mths)	119	160	29.10(24.90-33.68)	70.90(66.32-79.10)
Immunization status				
Fully immunized	100	15	24.45(18.85-28.07)	75.55(71.16-79.47)
Partially immunized	101		74.57(70.70-79.24)	25.18(21.22-29.61)
Zero dose	4		0.98(0.38-2.49)	99.02(97.51-99.62)

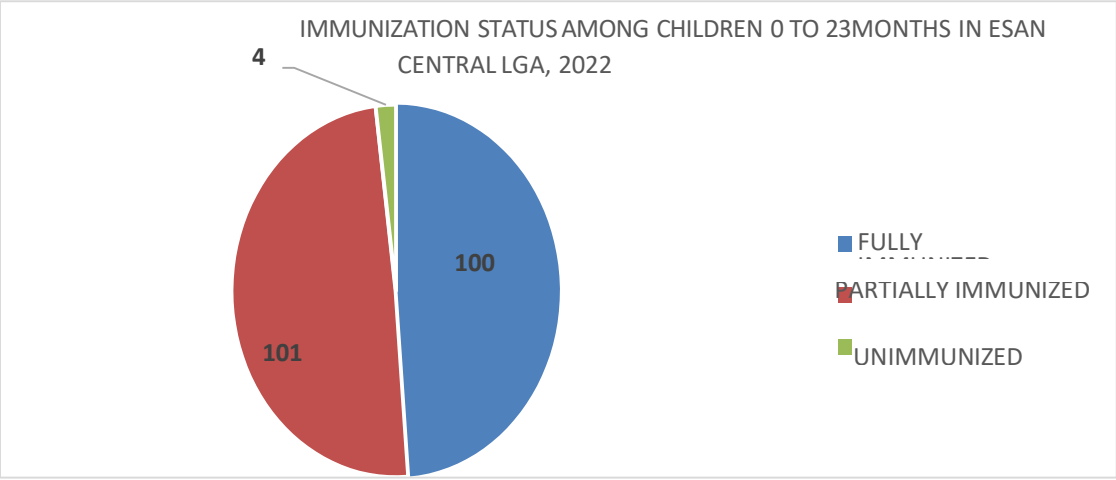

Fig 2; Immunization status among children 0-23months n=101

As shown in figure 2 above, (24.45%) were fully immunized, while 4 (0.98) never received any vaccine dose. On the other hand, of the fully immunized children, (75.31%), had evidence of immunization Table 4: The Individual factors responsible for dropout among children 0-23 months in Esan Central, 2022 (n=101) supported by the vaccination card. Similarly, (24.69%) were confirmed as partially immunized by card.

Table 4: The Individual factors responsible for dropout among children 0-23 months in Esan Central, 2022 (n=101)

Dropout rate factors	**Yes**	**%**	**95% CI lower**	**95% CI upper**	**No**	**%**	**95% CI lower**	**95% CI Upper**
Forgot appointment	20	19.80	12.54	28.91	81	80.20	79.09	87.46
Fear of side effects	25	24.75	16.70	34.33	76	75.25	66.67	83.30
Did not deliver in facility	20	19.80	12.54	28.91	81	80.20	79.09	87.46
No money to buy drugs	9	8.91	4.16	8.87	359	93.98	91.13	95.95
I didn't have to come back	25	24.75	16.70	34.33	76	75.25	66.67	83.30
Child sick	10	9.90	4.85	17.46	91	90.10	82.54	95.15
Not yet due	189	48.71	43.77	53.67	199	51.29	46.33	56.23

The factors that were predominantly responsible for dropout rate were fear of side effects (24.7%) and those who didn't know they were asked to come back, (24.75%), ignorance about the vaccine schedule(24.7%) and failure to remember the next appointment (19.80%) respectively.(Table 4)

Table 5: Bivariate association of individual related factors and immunization dropout in Esan Central LGA

Variable	**Categories**	**Immunization status**			**Chi-square**	**Df**	**P-value**
		Fully immunized (N=100)	**Partially immunized (n=101)**	**Unimmunized**			

Child was sick	Yes	0(0.00%)	10(9.90%)	0	10.0122	1	0.001555
	No	100(100%)	91(90.10%)	4			06
I didn't know I have to continue	Yes	1(1.00)	25(24.75%)	4	29.13765	1	0.000000
	No	99(99.00)	76(75.25%)		06		
I didn't deliver in the facility	Yes	3(3%)	44(14.43%)	4			
	No	97(97%)	261(85.57%)	0	78.5586	1	0.0001
Forgot appointment date	Yes	1(1.00%)	20(19.80%)	0	18.1445	1	0.000274 2
	No	99(99.00%)	81(80.20%)	4			
Fear of side effects	Yes	1(1.00%)	25(24.75%)	4	29.0515	1	0.000000
	No	99(99.00%)	76(75.25%)	0			
No money to buy drug	Yes	4(4.00%)	9(8.91%)		49.1877	1	0.0001
	No	96(96.00%)	92(91.02%)	4			

Bivariate analysis in the table above revealed that the health status of a child , caregiver knowledge on immunization schedule, the place and time of vaccination not known, the health status of the child during schedule (X2=10.0122, df=1, p=0.05), Ignorance of mothers on immunization schedule (X2= 29.13765, df=1, p=0.01), delivery not attended by a skill birth attendant (X2= 78.5586, df=1, p=0.01), mothers fear of side effects (X2= 29.0515, df=1, p=0.01), failure of mothers to remember appointment date (X2=18.1445, df=1, p=0.0002742), fear of side effects (X2= 13.7451, df=1, p=0.01) Lack of finance (X2= 49.1877, df=1, p=0.01) were associated with immunization dropout.

Table 6: Factors associated with facility utilization of mothers/caregivers related to droupout among children 0-23 months in Esan Central LGA

Responsible for low immunization action coverage	Immunization status			X^2	95%CI		AOR	COR	DF	P-VALUE
	Fully	Partially	Unimmunized		Upper	Lower				
Parity of Caregiver										
1-3	65	53	3	2.8825	0.9263	2.8506	1.6250	1.6250	1	0.08954588
>4	35	48	1							
Antenatal Visit										
Yes	17	72	1	7.1446	0.0461	0.1749	0.0898	0.4363	1	0.00751898
No	83	29	3							
No of times										
1-3	45	53	3	7.1446	0.2043	0.7901	0.4018	0.9149	1	0.0001
>4	38	19	1							
Tetanus Tociod Received										
Yes	9	76	3	91.725	0.014	0.073	0.0325	0.3263	1	0.0001
No	91	25	1							
No of Doses received										
1-2	49	64	3	18.705	0.014	0.073	0.0325	0.3263	1	0.00001616
>3	42	12	1							
Place of delivery										
Home and religious home	15	44	4	22.6984	0.1072	0.4095	0.2096	0.6795	1	0.0100002
Health Institution	85	57	0							
Postnatal visit										
Yes	15	51	0	26.4436	0.0957	0.3648	0.1869	0.6417	1	0.0000027
No	85	50	4							

Bivariate analysis in table 6 revealed that the parity of the caregiver affects immunization dropout rate *(X2*=2.8825, *df=1, p*<0.05*)*, total number of ANC received by the caregiver *(X2*= 57.3740, *df=1, p*<0.01*)*, Number of ANC received *(X2*= 7.1446, *df=1 ,p*<0.01*)*, number of doses of Tetanus Toxoid vaccine received by the caregiver *(X2*= 91.7255, *df=1, p<0.01)*, Number of TT doses received *(X2*=18.7059, *df=1, p*=<0.01*), place of deliveries by the mothers , either home or hospital delivery (X2*= 22.6984, *df=1, p*<0.01) and total number postnatal visits attended *(X2*= 26.4436, *df=1, p*<0.01) were associated with immunization dropout.

Table 7;Association between participants' demographic characteristics (such as age, sex, Religion and Ethnicity and Assessment of Immunization Coverage and dropout rate

Immunization Coverage			df	chisquare	Significance
Demographic Characteristics	Poor	Good			

Age Group	20-29	91(84.3%)	17(15.7%)	3	0.329[a]	0.955
	30-39	82(83.7%)	16(16.3%)			
	40-49	41(83.7%)	8(16.3%)			
	50 above	16(88.9%)	1(5.6%)			
Sex	Female	68(87.2%)	10(12.8%)	4	1.327[a]	0.857
	Male	106(83.5%)	21(16.5%)			
Religion						
	Christianity	43(81.1%)	43(81.1%)			
	Muslim	11(84.6%)	11(84.6%)			
	Others	2(100%)				

As shown in table 7, there was no significant association between sex, religion, and ethnicity. The chi-square test showed that there was no existing significant association between age, Sex, Religion, and Ethnicity. The P-values were greater than 0.05 alpha level of significance, hence, the null hypothesis was accepted as shown in Table 7

Table 8:

Drop rate Factors	**Yes**	**%**	**95% CI lower**	**95% CI upper**	**No**	**%**	**95% CI lower**	**95% CI Upper**
Health workers attitude	11	10.89	5.56	18.65	90	89.11	88.10	93.66
Long waiting time	30	29.70	21.02	39.61	71	70.30	60.39	78.98
Postponed session	40	39.60	30.01	49.83	61	60.40	50.17	69.99
Vaccine stock out	29	28.71	20.15	38.57	72	71.29	61.43	78.85
Next appointment not known	18	17.82	10.92	26.70	83	82.18	73.30	89.03
Order of arrival respected	19	18.81	11.72	27.81	82	81.19	72.19	88.28
No sitting area	16	15.84	9.33	24.45	85	84.16	75.55	90.67
Facility too far	16	15.84	9.33	24.45	85	84.16	75.55	90.67

From table 8 above, factors contributing to the dropout rate in immunization include health workers' attitudes, with 10.89% reporting dissatisfaction, long waiting times at 29.70%, postponed sessions at 39.60%, vaccine stockouts at 28.71%, uncertainty about the next appointment for 17.82%, non-respect of the order of arrival at 18.81%, absence of sitting areas at 15.84%, and the facility being too far for 15.84% of respondents. On the contrary, the majority, ranging from 70% to 90%, did not cite these factors as reasons for dropout, based on the provided confidence intervals.

Table 9; Bivariate Health facility factors that have association with dropout of immunization (n=409)

Health facility Factor	Fully immunized	Partially immunized	Chi-square statistics	95%CI Lower	95%CI Upper	AOR	COR	Df	P-value
Attitude of Health workers									
YES	0	11							
NO	100	90	13.2192	0.0000	0.2472	0.0000	-	1	0.0000
TOTAL	100	101							27709
Not respecting order of arrival									
YES	5	19							
NO	95	82	78.3979	0.0148	0.0975	0.038	0.095	1	0.0001
TOTAL	100	101				0	0		
No sitting area									
YES	3	16							
NO	97	85	9.1223	0.0485	0.6103	0.17200	0.0950	1	0.0025 2513
Long waiting time									
YES	8	30							
NO	92	71	16.3660	0.1067	0.4922		0.229	0.109	1	0.0000
TOTAL	100	101					2	1		5221
Session postponed									
YES	4	40							
NO	96	61	24.8008	0.0322	0.2808		0.095	0.074	1	0.0000
TOTAL	100	101					1	8		00064
No next appointment									
YES	2	18							
NO	98	83	13.3400	0.0222	0.4373		0.098	0.058	1	0.0002
TOTAL	100	101					6	3		5980
Facility too far									

YES	6	16						1	
NO	94	85	7.3473	0.0746	0.7196	0.231	0.719		0.0067
TOTAL	100	101				8	6		1641
Stock out of vaccine									
YES	1	29							
NO	99	72	29.0515	0.0035	0.1987	0.026	0.020	1	0.0000
TOTAL	100	101				5	1		007

Bivariate analysis revealed that the attitude of health workers, and distance to health facility (X2=13.2192, df=1, p=0.01), health workers not giving preference to mothers order of arrival to the clinic (X2=78.3979, df=1, p=0.01), Adequate sitting area not provided for mothers (X2=9.1223, df=1, p=0.05), Unnecessary waiting time during schedule (X2=16.3660, df=1, p=0.05), Mothers not given appointment date before the next schedule (X2=13.3400, df=1, p=0.00025980), Distant to health facility to assess vaccination (X2=7.3473, df=1, p=0.05), mothers to aware about session postponed (X2=24.8008, df=1, p=0.05) and vaccine not available during immunization session (X2= 29.0515, df=1, p=0.05) were associated with immunization dropout.

Discussion of Findings

Immunization Coverage

According to Goldie, et al., (2020); Corsi, Neuman, & Finlay, (2022), revealed that Nigeria was to reach immunization coverage rate of 80% by 1990 in order to reduce the mortality and morbidity rate by 50%, due to the EPI targeted diseases, only 20.4% reduction in neonatal mortality rate was achieved by 1990 and the actual neonatal mortality rate was 49/1000 live births. The Nigeria Demographic and Health Survey (NDHS) (2019) report showed that the trends in full immunization coverage of children aged 12–23 months increased from 13% in 2003 to 25% in 2013. The progress in the proportion of fully immunized children from 2003 to 2013 corresponded to the increase in ANC utilization (from 58% in 2003 to 61% in 2013) and SBA (from 35% in 2003 to 38% in 2013), (Afolabi et al., 2021). From 2008–2013, there was no significant improvement in the proportion of women who received PNC; 58% of women received no PNC within 41days after delivery in 2013, (Ireye et al., 2019), (Gender Norms and Health, 2019). The present findings, revealed that immunization coverage of various antigens of children 0- 23 months of age was higher and Pentavalent1 antigen 87.78%. Also, 89.73% for PCV1, 80.93%, while OPV2 is 87.78%, PCV2 73.59% and Pentavalent 2 antigen is 87.78%. Also, OPV 3 87.78%, PCV 3 64.30 % and Pentavalent 3 87.78%. Respectively, Measles 1, 26.65% Measles2, 60.15%, yellow fever 55.75% and 55.75 % for Men A vaccine. IPV1 and IPV2 79.71% and 59.80% vaccine were the antigen with the lowest coverage of children aged 0- 23 months, it also shows that Otoruwa 1 ward had highest proportion of fully immunized children with (41%), followed by Otoruwa2 ward with (24%)of children fully immunized nd Uwessan 1 ward with the least of (5%).

Immunization dropout rates

According UNICEF (2019), evaluated that the dropout rate is an indicator of immunization program performance and estimated to be 5% in 2016 for the 3-dose DTP series, with dropout highest in the African Region (11%) and lowest in the Western Pacific Region (0.4%). In routine expanded Program on immunization (EPI) programs, drop -out rate higher than 5% usually indicates quality problem with the program and need to be addressed. Dropout rate is used to measure program continuity and follow up. The dropout between the first and third doses of DPT-HepB-Hib, in particular is the best indicator as this vaccine is not typically given during campaigns .To achieve maximal protection against vaccine-preventable diseases, a child should receive all vaccines within recommended intervals, (Negussie, 2019).

In this study, dropout rate is the proportion of children who started certain vaccine but did not complete the next intended vaccine. The rate was 92.68% for OPV1 to OPV3, 92.68% for Pentavalent1 to Pentavalent3, and 68.2% for BCG to Measles2 , of the unimmunized, it was observed that mothers/caregivers of these children all had none/primary level of education, two of them were housewives, one a farmer and the other claimed to be employed. Four of them are from Esan; they are three females and a male. Of note, the observation is that they all delivered at home, had one TT vaccine, had ANC once and no PNC. Three of them are Muslim why one is a Christian; also they all said they were afraid of side effects. This is similar with the Study conducted in Ethiopia which showed that 66% of the children received BCG vaccine and 56% received measles vaccine. A relatively higher percentage of children received the first dose of DPT (64%). However, only 37% received the third dose of DPT, reflecting a dropout rate of 42%. More than eight out of every ten children (82%) received the first dose of polio, but only about four in ten (44%) received the third dose, reflecting a dropout rate of 46% in Ethiopia . In the study, those mothers/care givers who had fear of vaccine side effects were 3 times more likely to default immunization as compared with those Somali regions of Ethiopia respectively. This may be due to lack of health education and awareness creation efforts; and poor home visit rounds by health workers for reducing mothers fear about vaccine side effect, (Sharma,2021).

Factors responsible for Immunization Dropout rates

Current studies conducted by UNICEF and WHO, (2019), has identified several barriers to immunization, including lower parental education, younger maternal age, and lower income. Child's gender (being a female), large family size, low access to health services, and inadequate awareness about roles of vaccines were found to be barriers to completion of the required vaccinations. Children from poorest households were more likely to remain unimmunized. Regardless of interventions made to boost immunization services. Based on the bivariable analysis, birth order of the child, mothers' educational status, family size, place of delivery, ANC follow-up, and tetanus toxoid immunization were found to be significantly associated with children's full immunization status. Chi square test revealed that mothers' educational status, place of delivery, distance to a health facility, family size, and lack of ANC follow-up were found to be significantly associated with dropout rate. Mothers who attained secondary were 28.98% times more likely to have fully immunized children compared to illiterate mothers who had no education 25.91%. Mothers who attended ANC services for three or more times were 65.87 times more likely to have fully immunized children compared to mothers who never had ANC visits (AOR=65.87, 95% CI=5.25, 13.53), this was similar with findings by Ireye et al., (2019). Children born in health institutions had 53.66 times more chance of being fully immunized than children born at home (AOR=53.66, 95% CI=1.685, 1.069). Mothers who attended ANC services for three or more times were 65.87 times more likely to have fully immunized children compared to mothers who never

had ANC visits (AOR=65.87, 95% CI=5.25, 13.53). Children born in health institutions had 53.66 times more chance of being fully immunized than children born at home (AOR=53.66, 95% CI=1.685, 1.069).Children with mothers who had completed secondary education were 1.77 times more likely to be fully immunized compared with children whose mothers had no formal education; Children were 2.27 times more likely to be fully vaccinated if their mother had four or more antenatal care visits than those whose mothers had no antenatal visits, (Wiysonge et al., 2020). Missed opportunities, and high dropout rates were major factors contributing to low immunization coverage as shown by studies done in Mozambique, India and Banglades, (Wiysonge et al., 2020). Okwaraji, (2022), found out that proximity to health facility, measured by the time taken to reach the nearest health facility, was associated with full vaccination. Children from households living within a 60- minute walking distance from a health facility were more likely to complete vaccination schedules than those located farther than a 60 -minute walking distance (Wiysonge,et al.,2022).

Factors that influence immunization dropout

Based on a systematic review conducted by (Wiysonge et al., 2022), different factors were found to influence under-five childhood immunization uptake among parents in Africa. Immunization health education intervention among pregnant women, would hopefully improve childhood immunization uptake in African countries with poor coverage rates, (Ireye et al., 2019). The present study has demonstrated strong association between full immunization and antenatal care, skilled attendance at birth, and postnatal care check-up visit and discovered that full immunization decreases among women with no antenatal care visits, those who receive assistance from Traditional Birth Attendants during delivery, and those who do not go for postnatal care visits. In this present study , it was discovered that the attitude of health workers, health facility system , not respecting the order of arrival , no sitting area, long waiting time, no next appointment date, facility too distant , session postponed and stock out of vaccine were associated with immunization dropout. Such studies have revealed some associations between full immunization and factors such as age of mother, means of transportation to nearby health facility, mother's wealth status, mother's educational background, Migration, cultural and economic factors, vaccines stock out, healthcare system and facility utilization as one of the factors influencing dropout rate of child's immunization, (Afolabi et al, 2021) . This corroborated with similar findings of another study carried out Central Ethiopia. The study also showed that a child born to a mother who lacks knowledge on immunization schedule was 9 times more likely not to receive full immunization compared to the one born to a mother with knowledge on immunization schedule. Studies done earlier have indicated a significant relationship between immunization coverage and knowledge of immunization schedule. In a recent studies conducted by Yeung et al., (2021), it was revealed that Socio-cultural factors have impacted negatively on immunization coverage, significance is Nomadic lifestyle that was mentioned as an obstacle to Immunization. The mothers may be willing to have their children immunized but may not be within reach of any health facility during that particular period of time when the caregiver may be on the move and the outreach services are rare. A similar study reveals that a child born to a family that practices nomadic lifestyle are 11 more times likely not to have their child fully vaccinated, (Yeung et al., 2021). Over 80% of children delivered at home having not received full immunization, the place of birth was found to be one of the factors that influence full immunization, while 74.82% of the mothers had at least one ANC visit during their last pregnancy. Similarly, 79.22% of the respondents have received one or more doses of Tetanus Toxoid (TT) vaccine, 63.33% of the mothers gave their last birth in health institutions. This study is similar to the recent studies done in Esan Central where

34.23% gave birth at home, 2.44% delivered in religious homes, 61.37% and 38.63% had no postnatal checkup. The results indicate that a child delivered in a health facility was 5 times more likely to receive full immunization compared to one delivered at home. Distance to health facilities, was associated with non-completion of the recommended vaccination series. The study found out that those in close proximity to the health facility are 18 times more likely to have their children fully vaccinated than those who walk for more than an hour. This finding is consistent with the findings of previous studies that have associated distance to the nearest service delivery point with full immunization, (Tadesse , Deribew &, Woldie, 2019). Other studies have also found similar relationships between the place of birth of the child and immunization status, (Hussein & McCaw-Binns, 2021). This study revealed that a child born to a family that earns less than ksh 5000 per month is 3 (three) times more likely not to be fully immunized compared to one born to a family who earns more. Other investigators have also found similar associations between level of income and full immunization, (Michael et al., 2019). The health workers not giving the caregivers the next appointment date, poor sitting orders, not respecting first come, first served, no sitting areas, due to poor infrastructure in the facilities and vaccines stock out. Similar findings was also reported in Nigeria by fatiregun et al., (2019), where about tenth of the children were not vaccinated because of stock out of vaccine .The implication of frequent non- availability of vaccines during sessions and vaccines stock outs in PHCs are delayed vaccination, dropout rates and incomplete vaccination children. , most reasons for dropout rates to scheduled immunization in this study was lack of vaccine, this was also the most reported reasons given for immunization dropout rates in a similar studies in Benin City by Sadoh et al., (2019) .

The lack of vaccine may be due to the fact that supplies were not available to the facilities facilitated by logistics problems, like transportation, healthcare workers not motivated, poor distribution networks, health workers may be owed salaries , this reduces their motivation, other reasons may be inabilities of the health workers to forecast vaccine needs of the health facilities properly, since there was no report of vaccine shortage at that time in the country during the period of study, waiting time and not giving next appointment dates were the other reasons giving for immunization dropout rates. The prevalence of immunization dropout rates in this present study was reported in similar findings of study conducted in Anambra state Nigeria, where dropout rates for immunization was given as 16% (Rima , 2019) , the 16% noted in the study is low compared to 28% and 39% reported in Benin City , Edo state, Nigeria.(Uwaibi & Omokhua, 2021).The study has discovered a suboptimal rate in immunization coverage in Esan Central and this will be similar in other Local Government, to improve vaccine coverage and reduce dropout rate, interventional programs must be utilize, appropriate vaccine should be supplied, and healthcare workers must know how to forecast vaccine stock balance and report appropriately when there is vaccine stock out before their next session of immunization. Uwaibi & Omokhua, (2021).

Conclusion

The study highlights sub-optimal immunization coverage and dropout rates in Esan Central LGA, with common initiation of immunization at birth. Identified barriers include healthcare workers' attitudes, poor ANC and postnatal care, vaccine shortages, maternal education levels, and staff shortages. Recommendations entail comprehensive community programs involving stakeholders, modifying healthcare workers' attitudes through training, strengthening community-based care, reviewing vaccine procurement policies, conducting regular audits, and providing practical skills training for healthcare workers to improve immunization outcomes.

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