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## Socio-demographic factors associated with childhood immunization uptake in Akinyele Local Government Area, Oyo State, Nigeria

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### Abstract

**Background:** Immunization is an effective public health intervention for reduction of childhood mortality. The expected target coverage is 90%, however, Nigeria currently has coverage below this target and this has implications for childhood morbidity and mortality. Several reasons may account for this low coverage. The study was carried out to determine the socio-demographic factors associated with immunization completion.

**Methods:** This is a cross-sectional household survey that utilized multistage sampling technique. Four hundred mothers of children aged 12-24 months randomly selected from four communities were interviewed using structured questionnaire.

**Results:** Data from 383 (95.8%) participants were analysed and only 145 children (37.9%) were fully immunized. The results showed that children of mothers with secondary education or more (OR=3.45, 95% CI = 2.11, 5.66,  $p < 0.001$ ), those children whose mothers were married to their fathers (OR=3.17, 95% CI = 1.39, 7.21,  $p = 0.006$ ), children born to Christian families (OR = 1.72, CI = 1.07, 2.78,  $p = 0.026$ ) and those in urban area (OR = 3.89, 95% CI = 2.24, 6.74,  $p < 0.001$ ) are more likely to complete immunization.

**Conclusion:** Improving female education, strengthening at risk mothers, and designing adequate public health interventions to reach families in rural locations can improve immunization uptake.

**Keywords:** Immunization, uptake, household-survey, socio-demography.

### Résumé

**Contexte:** La vaccination est une intervention efficace de la santé publique pour la réduction de la mortalité infantile. La couverture cible prévue est de 90%, cependant, le Nigeria dispose actuellement d'une couverture en dessous de cette cible et ceci a des implications pour la morbidité infantiles et la mortalité en générale. Plusieurs raisons peuvent expliquer cette faible couverture. Les études ont été faites afin de déterminer les facteurs

sociodémographiques associés à l'achèvement des vaccinations.

**Méthodes:** C'est une enquête transversale auprès des ménages qui est menée en utilisant la technique d'échantillonnage à plusieurs degrés. Quatre cents mères d'enfants âgés de 12-24 mois choisies au hasard dans quatre collectivités ont été interrogées en utilisant le questionnaire structuré.

**Résultats:** Les données ont montré que parmi 383 (95.8%) des participants qui ont été analysées, 145 enfants (37.9%) ont été complètement vaccinés. Les résultats ont montré aussi que les enfants dont les mères ont une instruction secondaire ou plus sont de (OR = 3,45, IC à 95% = 2,11, 5,66,  $p < 0,001$ ), les enfants dont les mères se mariées avec leurs pères sont de (OR = 3,17, IC 95% = 1,39, 7,21,  $p = 0,006$ ), les enfants nés de familles chrétiennes (OR = 1,72, CI = 1,07, 2,78,  $p = 0,026$ ) et ceux en zone urbaine (OR = 3,89, IC à 95% = 2,24, 6,74,  $p < 0,001$ ) sont les plus susceptibles de compléter la vaccination.

**Conclusion:** L'amélioration de l'éducation des femmes, le renforcement de mères au risque, et la conception adéquate des interventions de santé publique d'atteindre les familles dans les régions rurales peuvent améliorer le taux d'immunisation.

### Introduction

In Nigeria, statistics has shown that one child in five dies before the fifth birthday and vaccine preventable diseases (VPDs) account for about 22% of these deaths, therefore, over 200,000 children a year are dying of VPDs [1]. Routine immunization is proven to be one of the most cost effective ways of reducing these diseases and the resultant mortality. Immunization is a key component of initiatives to improve and monitor progress in child health, it is also an important strategy in accomplishing the Millennium Development Goals (MDGs), especially the goal to reduce deaths among children under five years old (MDG 4) [2].

Nigeria's routine immunization schedule stipulates that infants should be vaccinated with the following vaccines: a dose of Bacillus Calmette-Guerin (BCG) vaccine at birth (or as soon as possible); three doses of diphtheria, pertussis and tetanus (DPT) vaccine at six weeks, 10 and 14 weeks of life; at least three doses of oral polio vaccine (OPV); at

**Table 1:** Immunization coverage of participants' children Aged 12- 24 months in Akinyele Local Government Area of Oyo State

Vaccine Type	Number of Children ImmunizedN=383	Percent
BCG	371	96.9
OPV0	283	73.9
OPV 1	351	91.6
OPV 2	322	84.1
OPV 3	293	76.5
DPT 1	358	93.5
DPT 2	330	86.2
DPT 3	302	78.9
Hepatitis B1	338	88.3
Hepatitis B2	317	82.8
Hepatitis B3	284	74.2
Measles Vaccine	272	71.0
Yellow Fever Vaccine	217	56.7

**Table 2:** Multivariate logistic regression of immunization completion on socio-demographic characteristics of children aged 12-24 months

Socio-demographic Characteristics	Immunization Completed				Adjusted OR	CI	P-value
	Yes		No				
	N	%	N	%			
<i>Mothers' Education</i>					3.45	2.11 – 5.66	<0.001
≥ Secondary Education	98	55.1	80	44.9			
< Secondary Education	47	22.9	158	77.1			
<i>Child's Place of Birth</i>					1.14	0.58 – 2.23	0.099
Home	16	23.9	51	76.1			
Health Facility/ Mission House	129	40.8	187	59.2			
<i>Family religion</i>					1.72	1.07 – 2.78	0.026
Christianity	98	46.2	114	53.8			
Islam	47	27.8	122	72.2			
<i>Family type</i>					0.98	0.20 – 4.78	0.979
Monogamy	107	43.5	139	56.5			
Polygamy	35	28.0	90	72.0			
<i>Married to child's father</i>					3.17	1.39 – 7.21	0.006
Yes	134	41.7	187	58.3			
No	11	17.7	51	82.3			



significant risks were then subjected to multivariate logistic regression to assess the association and contribution of the independent variables (socio-demographic characteristic) on immunization completion (dependent variable). Statistical significance was set at  $p < 0.05$ .

A child was considered as fully immunized in the study if he or she had received one dose of BCG, three primary doses of DPT, OPV (excluding OPV 0) and Hepatitis B, one dose each of Measles and Yellow fever vaccines before his or her second birthday.

The Oyo State Ministry of Health Ethical/Research Review Committee gave approval for the conduct of the study. Subsequent to detailed information about the study, participants indicated their willingness to participate through their signatures or fingerprints.

## Results

### *Socio-demographic characteristics of study participants*

Only 383 (95.9%) of the 400 questionnaire were appropriate and adequate for data analysis. Eleven mothers were excluded due to ineligibility of their children on account of age, five on account of incomplete information on survey questionnaires and one mother decided to withdraw from the study.

The mothers' ages ranged from 15 to 48 years with a mean of  $29.2 \pm 7.0$  years. The modal age group of mothers interviewed was 25-29 years. Three hundred and twenty one (83.8%) mothers were married to the fathers of the eligible children. Two hundred and one mothers (52.5%) were petty traders. Three hundred and seven (80%) of the mothers had some form of formal education. The modal educational level was secondary education attained by 124 (32.4%) mothers. The number of children of participating mothers ranged from one to eight. One hundred and eighty nine and 212 of the participants were Muslims and Christians respectively.

### *Immunization status of children*

Out of the 383 children whose mothers participated in the study, immunization cards were available in 134 (35%) while 249 (65%) mothers gave verbal immunization history. The types of vaccines received were ascertained by the names given by the mothers and the routes and time of administration of the vaccines. No further verification was done to authenticate the verbal immunization information given by the mothers. All the 383 (100%) children had received at least 2 vaccines. BCG uptake was 96.9%, DPT 3<sup>rd</sup> dose was 78.9%, and Yellow Fever uptake

was 56.7%. Only 145 (37.9%) children out of 383 were fully immunized with all the vaccines in the childhood immunization schedule in Nigeria. The Immunization coverage of the children was as shown in Table 1.

### *Socio-demographic factors associated with immunization uptake*

Socio-demographic factors associated with completeness of immunization were as shown in Table 2. Mothers with secondary or higher levels of education were about 3 times more likely to have their children complete their immunization compared to children of mothers with lower levels of education, (OR = 3.45, CI = 2.11 – 5.66,  $p < 0.001$ ). Also, participants who were married to the fathers of eligible children were about thrice more likely to have their children complete immunization compared to mothers who were single or no longer married to the fathers of the eligible children, (OR = 3.17, CI = 1.39 – 7.21,  $p = 0.006$ ). Forty seven (24.9%) of children from Muslim families and 98 (46%) from Christian families completed their immunization. Children from Christian families were about twice more likely to complete their scheduled immunization compared with children from Muslim families (OR = 1.72, CI = 1.07-2.78,  $p = 0.026$ ).

Gender (OR = 1.53, CI = 0.99 – 2.37,  $p = 0.051$ ), position of child (OR = 1.52, CI = 0.93–2.49,  $p = 0.093$ ), place of child's birth (OR = 1.14, CI = 0.58 – 2.23,  $p = 0.099$ ), number of children born to mother (OR = 1.30, CI = 0.73 – 2.32,  $p = 0.373$ ), and family type, (monogamy or polygamy) (OR = 0.98, CI = 0.20 – 4.78,  $p = 0.979$ ) were not significantly associated with immunization completion in the study.

Figure 1 summarizes the comparison of rural /urban difference in immunization completion among the children. Children from urban communities were about 4 times more likely to complete immunization compared with children from rural communities (OR = 3.89, CI = 2.24, 6.74,  $p < 0.001$ ).

## Discussion

This study showed that maternal education was found to have significant association with full immunization uptake as mothers with secondary or higher level of education were three times more likely to have their children fully immunized than those with less than secondary education level. Educated mothers are likely to be better informed and may ensure that necessary immunization services are provided to their children. Community health nurses and other health care workers should continue to advocate for female education as



have strong preference for male children [29,30]. It is suggested that multi-ethnic studies be conducted to redefine the association between gender and immunization.

Variation was observed in this study between the full immunization coverage in rural areas and urban areas. Completion of immunization is almost 4 times higher in children from urban communities than those from rural communities. This is congruent with findings of previous studies in Iran [23], and Nigeria [31,32] with higher coverage in urban areas as compared to the rural area. However, other studies in Ethiopia [21], and Hong Kong [33] reported immunization coverage being higher in rural areas than urban areas.

National and state immunization programmes at rural levels should be tailored to reach underserved populations in all areas, as well as designing adequate public health interventions to reach families living in remote locations in order to improve immunization uptake.

#### Limitation

Verbal history of children's immunization by majority of mothers without immunization card verification or any other form of verification is a limitation of this study. It is possible that some participants might have been unintentionally biased in their responses. Also, the accuracy of mothers' recall of their children immunization status cannot be verified in the study.

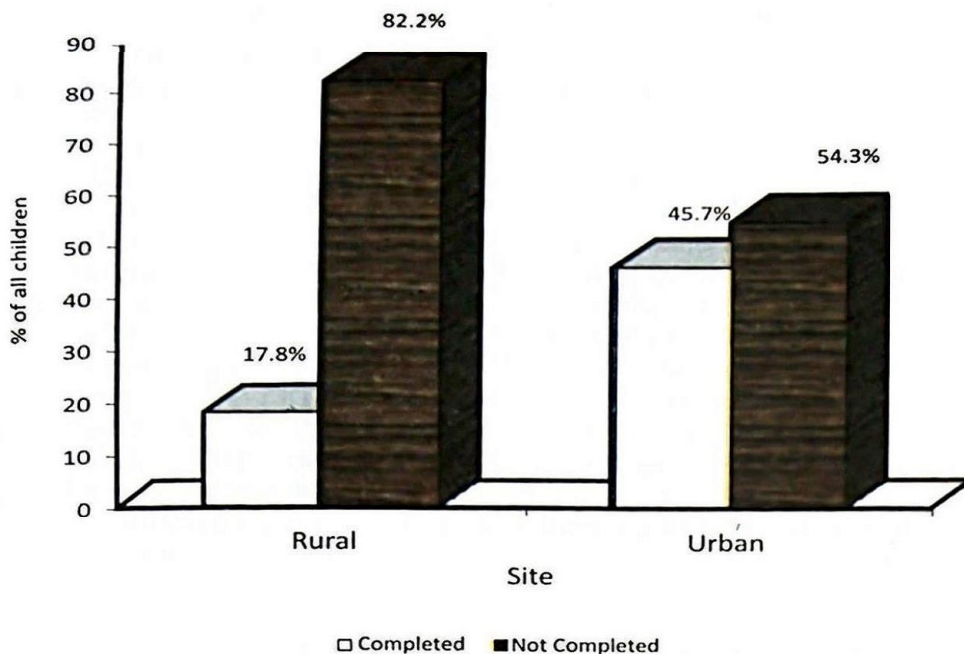
#### Conclusion

This study revealed that socio-demographic characteristics such as mothers' education, family religion, and mothers' marital relationship with a child's father had strong association with the children's immunization completion. It is therefore important to ensure that public health interventions for promoting childhood immunization address these characteristics. Hence strategies for improving female education, strengthening the individual families of mothers that their children are at risk of not completing immunization, involving religious leaders in immunization campaign as well as designing adequate public health interventions to reach families living in rural locations should be employed to improve immunization uptake.

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Odds Ratio = 3.89, 95% Confidence Interval = 2.24, 6.74,  $P < 0.001$

Fig. 1: Comparison of immunization completion in rural and urban communities

this has implication for childhood immunization and childhood morbidity and mortality [2].

The association between maternal education and immunization completion found in this study agrees with findings from previous studies in, India [7], Mozambique [20], Ethiopia [21] and some parts of Nigeria [22]. However, a study in Iran by Roodpeyma *et al* found no association between mothers' education and immunization uptake [23].

Family cohesion has positive implication for health of members of each family [24]. Findings in this study revealed this assertion as children whose mothers are married to their fathers were three times more likely to have completed immunization compared to children whose mothers were either not married at all or married to different husbands. Similar studies in Columbia, USA [10] and Turkey [11] showed that children from unmarried and separated mothers are at risk of under-vaccination or non-vaccination. Advocacy for family cohesion should be considered as an integral part of community health nurses' services and efforts should be made to develop health care workers' skill in this area. Through assessment, health care providers can determine which families are at risk for under-immunization and these families should receive specific individualized reminders to assist them in their follow up and compliance with their children's immunizations.

Another key finding in this study is the significant association of religion with childhood immunization uptake. The findings of this study supported previous reports in Nigeria [3,22] and India [25,26] which claimed that Islamic religion was significantly associated with incomplete and non-immunization. There is need for further studies to explore the possible reasons for these findings. The implication of this however is that intervention programmes need to identify the religious beliefs on immunization and address them during awareness campaigns and probably involve religious leaders more in the awareness campaigns.

Gender was not found to be associated with immunization completion in this study. This corroborates the findings in Edo [8,27] and Sokoto [14] states in Nigeria where there was no gender difference among children who were fully vaccinated. However this is contrary to other findings in Bangladesh [28] where completion of all doses of immunization for a male child was found to be significantly higher as compared to female and another study in Columbia, USA [10] where unvaccinated male were significantly higher than female. Gender equity in immunization completion in the present study may be as result of the location of the study as many Yoruba mothers do not really have preference for male children even though the fathers



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**Conclusion:** La PIO n'est pas corrélée avec la SBP tout au long de la grossesse.

## Introduction

Pregnancy is associated with a marked increase in the level of steroid hormones which affects the functioning of most body systems including ocular function. Ocular changes occurring during pregnancy could be physiological, pathological and sometimes a modification of pre-existing conditions [1]. A number of hormones are known to affect intra ocular pressure (IOP). Of these, the female sex hormones are the predominant ones to cause variations in IOP. This is because sex hormones are steroids and steroids have an effect on salt and water metabolism. This leads to an increase in total body fluid content which builds up in the spaces between cells causing water retention [2, 3].

The influence of sex hormones on IOP has been the focus of numerous studies [4-6]. The ovaries are the primary source of endogenous oestrogen in women of reproductive age. During menopause, a changing hormone profile in the body causes important shifts in the levels of oestrogen present in the female body. Overall, this change is primarily a large drop in the average amount of circulating oestrogen. The falling level of oestrogen is the primary cause of familiar menopause symptoms [7,8]. As levels of oestrogen decrease, a woman's risk of developing high blood pressure increases dramatically [10]. Due to the interplay of other hormones and the effect that oestrogen has on other important risk factors, postmenopausal women are at higher risk for developing high blood pressure than men [11]. Studies that have examined the effect of menopause on visual function, cardiovascular and ocular hemodynamics showed that menopausal women had significantly higher IOP in both eyes as compared to premenopausal women [12]. Other studies have reported a positive correlation between IOP and systemic blood pressure [13-15].

The relationship between high blood pressure and menopause is complicated. While there is great indication that blood pressure increases with menopause, there is not a clear understanding of why this happens [16, 17]. Many factors have been considered such as age, and weight gain which happen as women get older. However, recent studies [18-20] suggest that declining oestrogen levels may be the main contributing factor for elevated blood pressure in menopausal women. The increase in eye pressure is a typical age-related phenomenon which may also be the result of an oestrogen deficiency [21]. As an example, pre-menopausal women have been reported to have lower diastolic and systolic

pressure than - men, but as women get into menopause, their systolic pressure increases to become slightly higher than that of men [22].

Presently, there is a dearth of readily accessible studies on ocular changes in pregnancy and menopause in Africans including Nigerian women. The dangers of this are that peculiarities that may exist in Nigerian women, if any, and that may be crucial to effective management of these women remain unearthed. It was in a bid to examine an aspect of this that this study was conceived. The aim of this study was to determine if there is any correlation in the pattern of changes in IOP and systemic blood pressure in physiological conditions of pregnancy and menopause in Nigerian women.

## Materials and method

This was a longitudinal study. A hundred pregnant women aged between 20 to 35 years, (mean  $\pm$  SD  $27 \pm 2.10$ ) were recruited by systematic random sampling by picking every third woman that reported for booking at the antenatal booking clinic of the Department of Obstetrics and Gynaecology of the University of Benin Teaching Hospital (UBTH). The women were screened for systemic and ocular diseases and these were used as the exclusion criteria for participation in the study. Test was carried out in the first, second and third trimesters of pregnancy and 6 weeks post partum. Sixty six postmenopausal women were also recruited for this study. Thirty-three of them were normotensive and 33 were hypertensive. The women were aged between 45-55 years old (mean  $\pm$  SD  $51.09 \pm 2.34$  and  $52.30 \pm 1.52$  respectively).

The postmenopausal women were also selected by systematic random sampling by picking every third presenting woman from among members of staff of the University community, teachers from randomly selected primary and secondary schools and members of neighbouring local churches. Informed consent was obtained from all the women and ethical approval for the study was obtained from UBTH Ethics Committee. Blood pressure was measured with a manual mercury sphygmomanometer in the sitting position using the right upper arm and the appropriate size cuff. Two readings were taken and the average recorded. Monocular direct ophthalmoscopy was done to rule out any diseases of the posterior segment. Intraocular pressure was measured with the handheld Kowa applanation tonometer. The eyes were anaesthetized with 0.5% Proparacaine and fluoresceine strips impregnated with 1 mg of sodium were used to stain the eyes. The average of two readings was recorded per subject.