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Factors associated with non-adherence to the immunisation schedule among children under one year of age (study conducted at Wangata General Referral Hospital between June 2021 and December 2024)

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Abstract

Introduction: This study explores a major public health issue, namely the problem of insufficient vaccination coverage among children under one year of age, where failure to adhere to the immunisation schedule can lead to epidemics of preventable diseases and increase infant mortality.

Several socio-economic and educational factors can influence parents' adherence to the immunisation schedule. This study aims to identify and analyse the main factors associated with non-adherence to the immunisation schedule among children under one year of age, specifically at Wangata General Referral Hospital. The study was conducted between June 2021 and December 2024

Method: The study adopted a quantitative, cross-sectional (descriptive) approach, involving mothers of children under one year of age receiving care at Wangata General Hospital. Data were collected using standardised questionnaires and analysed using descriptive and multivariate statistics; the factors studied included: mothers' educational attainment, socio-economic status, access to healthcare services, cultural beliefs regarding vaccination, and the organisation of vaccination campaigns.

Results: The study revealed several factors influencing non-compliance with the immunisation schedule:

- **Mothers' level of education:** Children whose parents had a low level of education showed a non-compliance rate with the immunisation schedule of

68 per cent. Furthermore, parents aged under 25 had a non-compliance rate of 62 per cent, likely due to a lack of experience and support.

- **Access to healthcare services:** the impact of geographical distance influences the rate of non-compliance with the immunisation schedule and access to vaccination services.
- **Cultural beliefs:** Around 25 per cent of parents expressed concerns about the side effects of vaccines, particularly fever and local reactions, with a non-compliance rate of 65 per cent. It was observed that 18 per cent of parents waited for recommendations from traditional healers before vaccinating their children, leading to delays in vaccination for these children, with a non-compliance rate with the immunisation schedule approaching 70 per cent.

Furthermore, a lack of information on the importance of vaccination and financial difficulties appear to be underlying factors contributing to non-compliance with the immunisation schedule.

Conclusion: Non-compliance with the immunisation schedule among children under one year of age at Wangata General Referral Hospital is multifactorial. It is essential to implement public policies aimed at increasing vaccination coverage and reducing barriers to access to healthcare services in order to prevent the re-emergence of preventable diseases.

Keywords: Children, Failure to adhere to the immunisation schedule, Wangata, Ecuador.

1. Introduction

Childhood vaccination is one of the most effective strategies for preventing serious illness and deaths linked to infections in infants (WHO, 2019). In this context, the immunisation schedule recommended by the World Health Organisation (WHO) aims to protect children against potentially fatal diseases such as polio, whooping cough, tetanus, diphtheria and measles. However, despite the availability of effective vaccines, failure to adhere to the immunisation schedule remains a major problem in many developing countries, including the Democratic Republic of the Congo (DRC), where the incidence of certain preventable diseases remains high. This situation has dramatic consequences for children's health, undermining global efforts to eradicate some of these diseases (UNICEF, 2022).

Failure to adhere to the immunisation schedule is influenced by a complex combination of social, economic, cultural and logistical factors. Among the socio-economic factors, it is noted that in low-income regions, access to healthcare remains limited. Families in rural areas, for example, face major obstacles such as the distance to health centres, the cost of transport and the limited availability of vaccines; these factors often make it difficult to vaccinate children regularly within the timeframe recommended by the Expanded Programme on Immunisation (EPI).

In addition to economic and geographical barriers, mothers' educational attainment plays a key role in adherence to the immunisation schedule. Numerous studies show that a low level of maternal education is correlated with lower vaccination rates; a lack of understanding of the benefits of vaccination or a lack of awareness of the risks posed by preventable diseases contributes to vaccine refusal. Furthermore, cultural and religious beliefs are a major factor in certain communities. Misconceptions, such as mistrust of foreign vaccines or rumours regarding vaccine safety, can dissuade mothers from following medical advice.

Social influences also play an important role in some cases; advice from the extended family, neighbours or non-medical authority figures can be more influential than the recommendations of healthcare professionals. This dynamic can lead to a lack of trust in the healthcare system, particularly when health authorities fail to address parents' concerns in a clear and reassuring manner.

Other organisational and logistical factors relating to the provision of healthcare services also influence adherence to the vaccination schedule. In some regions, healthcare infrastructure is inadequate, with vaccine stock-outs and a shortage of qualified staff, which can delay the administration of vaccine doses. Logistical difficulties in the vaccination campaign and the lack of follow-up for vaccinated children increase the risk of non-compliance with the schedule.

This study focuses on identifying the factors associated with non-compliance with the immunisation schedule among children under one year of age at the Wangata General Referral Hospital, a healthcare facility located in Equateur Province, DRC. By understanding these factors, the aim is to better target public health interventions to improve vaccination coverage and reduce inequalities in access to vaccination.

It is essential to develop tailored strategies that take into account the specific barriers faced by families, in order to

ensure better health protection for children and to help reduce preventable infant mortality through vaccination.

2. Methodology and techniques used

2.1. Methodology

This methodology enables the collection of data, details and insights into the factors associated with non-compliance with the immunisation schedule, incorporating the perspectives of both mothers and healthcare professionals. The results obtained will help to identify specific barriers to infant vaccination and to develop recommendations for improving vaccination coverage at Wangata General Referral Hospital.

2.2. Study setting

This study is being conducted in Equateur Province, at Wangata General Referral Hospital, which was selected due to its central role in providing healthcare to a mixed urban and rural population, thereby enabling a thorough assessment of the factors associated with non-compliance with the immunisation schedule.

2.3. Study design

This is a cross-sectional study. It was designed to identify and analyse the factors associated with non-compliance with the immunisation schedule among children under one year of age in a specific context.

2.4. Sampling

The study employed a stratified random sampling method to select a representative sample of mothers and children under one year of age who attended the maternity and paediatric departments at Wangata General Referral Hospital during the data collection period, namely between June 2021 and December 2024

2.5. Selection criteria

The selection criteria for participants were defined to include a representative sample of willing legal mothers, children under one year of age who attended the hospital during the study period between June 2021 and December 2024, and the availability of a vaccination history for the infants, enabling comparison of vaccination dates with those recommended by the immunisation schedule. Excluded participants include: children not enrolled in the hospital's vaccination programme or who had not yet received their first dose of the vaccine; parents or guardians who did not wish to take part in the study;

and mothers whose children were already over one year old at the time of inclusion in the study.

2.6. Ethical Considerations

The study was conducted in accordance with the fundamental ethical principles governing research involving human subjects, as defined by the World Health Organisation's (WHO) **Declaration** of Helsinki and local ethical guidelines in the DRC. These principles include respect for participants' autonomy, data confidentiality, scientific integrity and beneficence.

3. Results and discussion

Here we first present the results obtained, which are set out in the various tables.

The sample comprised 150 parents of children under one year of age, selected from the Wangata General Referral Hospital during the period of our investigation, namely between June 2021 and December 2024

3.1. Sample size

Determining the sample size depends on several methodological factors. For a study on the factors associated with non-compliance with the immunisation schedule among children under one year of age in a health zone such as Wangata, the following factors should be taken into account:

- **Standard calculation method**

The basic formula for calculating the sample size in a cross-sectional (descriptive) study is:

$$n = \frac{Z^2 \times P \times (1 - P)}{d^2} \quad (1)$$

n: sample size

Z: value from the normal distribution for a given confidence level (1.96, generally set at 95 per cent)

P: estimated proportion of non-compliance with the immunisation schedule (e.g. 0.30 if estimated at 30 per cent)

d: acceptable margin of error (usually 0.05 or within 5 per cent)

Example: if it is estimated that 30 per cent of children do not adhere to the immunisation schedule, with a 5 per cent margin of error:

$$n = \frac{(1,96)^2 \times 0,50 \times (1-0,50)}{(0,05)^2} \approx 384 \text{ participants}$$

The total population of children under one year of age in the Mbandaka health zone is estimated at 384. As the size **n** of the population under investigation is less than 10,000 (384 children under one year of age), the reduced sample size will be calculated using the formula:

$$N = \frac{n}{1 + \left(\frac{n}{x}\right)} \quad (2)$$

Where: N = The desired sample size (when the population size is less than 10,000); n = The desired sample size (when the population size is greater than 10,000); x = The estimated population size (in our case, 300). The desired sample size **N** (when the population size is less than 10,000) is therefore:

$$N = \frac{n}{1 + \left(\frac{n}{x}\right)} = \frac{384}{1 + \left(\frac{384}{300}\right)} \approx 168$$

It should be noted that during the data collection process, only 152 mothers of children under one year of age agreed to take part in the survey.

The results obtained in relation to socio-demographic, economic and cultural information are presented in tabular form as follows:

Table 1: Mothers' educational attainment

No.	Level of education	Frequency	Percentage (%)
1	None	42	28
2	Primary	65	43
3	Secondary or higher	45	29

This table shows that, out of 152 women who voluntarily took part in our study, 71 per cent of mothers have a low level of education, which may limit their understanding of the immunisation schedule. This factor has been found to be significant in several studies in the DRC. It is therefore

essential to improve mothers' health education through targeted campaigns.

Table 2: Monthly household income

No.	Estimated income (USD)	Frequency	Percentage (%)
1	< 50	78	52
2	50–100	48	32
3	> 100	26	16

Table 2 shows that the majority of families surveyed live in precarious circumstances, which consequently limits their access to healthcare. Low monthly income appears to be correlated with non-vaccination. Community incentives or logistical support could improve vaccination coverage.

Table 3: Distance from home to vaccination centre

No.	Distance (km)	Frequency	Percentage (%)
1	< 2	40	27
2	2–5	68	45
3	> 5	44	28

It should be noted that 73 per cent of families live more than 2 km from the vaccination centre; this factor is likely to be the main reason for non-compliance with the vaccination schedule, as the distance discourages regular visits to the vaccination centre. Distance is a recognised logistical barrier in African studies. This is why the establishment of mobile units or community vaccination posts is recommended.

Table 4: Adherence to the vaccination schedule

No.	Vaccination status	Frequency	Percentage (%)
1	Fully vaccinated	67	44
2	Partial	53	35
3	Not met	32	21

It is observed that fewer than half of children have received all the required vaccinations by 12 months. This rate is below the EPI targets ($\geq 90\%$). A reminder system (text messages, home visits) could improve uptake.

Table 5: Missed opportunities for vaccination

No.	Number of visits without vaccination	Frequency	Percentage (%)
1	None	104	68
2	≥ 1 missed opportunity	48	32

Around one third (or more) of children attended at least one visit without receiving a vaccination. Missed opportunities, which are considered preventable, exacerbate non-compliance; therefore, prioritising training for health workers to reduce this problem would be desirable.

Table 6: Availability of vaccines

No.	Months of shortage	Relevant antigen	Number of days
1	June 2022	VAR	12
2	October 2023	Penta 3	8

Stock-outs jeopardise the continuity of vaccination programmes. Such interruptions are common in secondary urban areas; it is advisable to strengthen the supply chain.

Table 7: Parents' views on vaccination

No.	Perception	Frequency	Percentage (%)
1	Positive	74	49
2	Neutral	38	25
3	Negative	40	26

Around a quarter of parents hold a negative perception, influenced by rumours or beliefs. Perception is a key behavioural factor, which is why community leaders can play a role in raising public awareness to dispel this negative perception.

Table 8: Level of knowledge of the immunisation schedule

No.	Level of knowledge	Frequency	Percentage (%)
1	Good	46	31
2	Average	58	39
3	Low	48	30

Table 8 shows that approximately 69 per cent of parents have insufficient knowledge of the immunisation schedule. This factor is strongly associated with drop-out. Visual posters and educational sessions can improve understanding.

Table 9: Quality of reception at the centre

No.	Assessment	Frequency	Percentage (%)
1	Good	62	41
2	Average	54	36
3	Poor	36	23

A reception perceived as negative may discourage patients from returning to the centres for subsequent doses. The quality of the relationship is an important institutional factor. Training staff in active listening and empathy is recommended.

Table 10: Statistical correlation between factors and non-adherence

No.	Associated factor	OR (95% CI)	p-value
1	Low educational attainment	2.1 (1.4–3.2)	< 0.01
2	Distance > 3 km	1.8 (1.2–2.7)	< 0.05
3	Lack of awareness of the PEV	2.4 (1.6–3.5)	< 0.01

Comments: These factors are statistically significant in relation to non-compliance with the immunisation schedule. The results confirm the hypotheses and are consistent with the studies by Mazaba Mata Justin (2025) and Guillain Bokoko Bikoko (2025). These data can inform local public health policies.

The aim of this study was to identify the factors associated with non-compliance with the immunisation schedule among children under one year of age seen at the Wangata General Referral Hospital.

The results show that 63 per cent of children do not adhere to the immunisation schedule, indicating insufficient vaccination coverage in this area. This situation represents a significant public health problem, as it may contribute to the resurgence of vaccine-preventable diseases.

Mothers' educational attainment is a key factor. In our study, 71 per cent of mothers had a low level of education. This may limit their understanding of the benefits of vaccination and of adhering to the immunisation schedule. Similar findings have been reported in several studies conducted in sub-Saharan Africa.

Socio-economic conditions also influence adherence to the immunisation schedule. In our study, 63 per cent of households had a low income. Financial difficulties may limit access to immunisation services, particularly due to transport costs.

Geographical accessibility to health services is another key factor. The results show that 73 per cent of families live more

than 2 km from the vaccination centre. This distance may discourage parents from travelling regularly to the health centre to attend vaccination appointments.

Cultural beliefs and negative perceptions regarding vaccines also constitute barriers. In our study, some parents expressed concerns about the side effects of vaccines, particularly fever and local reactions. Furthermore, some parents consult traditional healers before having their children vaccinated, which often leads to delays in vaccination.

Finally, a lack of information on the importance of vaccination is a significant factor in non-compliance with the immunisation schedule. It is therefore necessary to strengthen health education and community awareness-raising activities in order to improve parents' understanding of the benefits of vaccination.

5. Conclusion

The aim of this study was to identify the factors associated with non-compliance with the immunisation schedule among children under one year of age seen at the Wangata General Referral Hospital between June 2021 and December 2024. The results show that this phenomenon constitutes a genuine public health problem and is influenced by several interrelated socio-demographic, economic, geographical and cultural factors.

Analysis of data collected from the mothers of children under one year of age revealed that the mothers' low level of education, the households' economic vulnerability, the distance of their homes from vaccination centres, and certain cultural beliefs are major determinants of non-compliance with the immunisation schedule. Indeed, the majority of mothers surveyed had a low level of education, which limits their understanding of the importance of vaccination and the recommended vaccination schedule. Furthermore, financial difficulties and the considerable geographical distance between the home and health facilities represent significant barriers to regular access to vaccination services.

Furthermore, certain negative perceptions or concerns regarding the side effects of vaccines, as well as the influence of traditional healers, also contribute to delays in or the abandonment of vaccination for some children. These factors demonstrate that non-compliance with the immunisation schedule does not depend solely on the provision of health services, but also on the socio-cultural and economic context in which families live.

In light of these findings, it appears essential to strengthen community awareness-raising strategies on the importance of

vaccination, to improve geographical and financial access to vaccination services, and to promote health education for parents, particularly mothers. The involvement of community representatives and local leaders could also help to reduce socio-cultural barriers and improve families' adherence to the Expanded Programme on Immunisation.

Ultimately, improving adherence to the immunisation schedule among children under one year of age requires a multi-sectoral approach involving health authorities, healthcare professionals and local communities in order to ensure better vaccination coverage and prevent the resurgence of vaccine-preventable diseases.

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