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Impact of Conflit on Children Vaccination: Evidence from Central North, North and Sahel Regions of Burkina Faso

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Abstract:-

- ***Background:***

Low immunization coverage and epidemics of vaccine-preventable diseases epidemics are a major concern in conflict-affected countries, particularly in the particularly in sub-regions most affected by conflict.

- ***Objective:***

To assess the factors associated with immunization coverage among children living in insecure or conflict zones in the Central North, North and Sahel regions of Burkina Faso.

- ***Methodology:***

Descriptive, cross-sectional study cross-sectional study using a questionnaire to determine the factors associated with immunization coverage of children in conflict zones in Burkina Faso. The study population consisted of mother-child pairs under two years of age.

- ***Results:***

A total of 384 mother-child pairs took part in the study and more than three-quarters (84.6%) of children were aged between 6 and 12 months. Only 28.4% of children were completely vaccinated. Several factors were associated with incomplete vaccination, including the child's advanced age, the mother's young age, illiteracy, not possessing a vaccination card, inaccessibility of health services, distance from a health center, duration of the conflict, displacement of families, and loss of a family member.

- ***Conclusions:***

Children in conflict zones are at higher risk of being under-immunized. The findings emphasize the importance of prioritizing targeted interventions and vaccination programs in conflict-affected areas of Burkina Faso to improve immunization coverage.

Keywords:- *Child, Vaccination, Conflict Zone, Burkina Faso.*

I. INTRODUCTION

Childhood vaccination is one of the most cost-effective public health interventions to reduce child morbidity and mortality [1]. Despite advances in the development of vaccines and immunization systems around the world, populations living in conflict zones often have limited or no access to life-saving vaccines, putting them at increased risk of morbidity and mortality from vaccine-preventable diseases [2].

Global child immunization coverage stagnated in 2023, leaving 2.7 million more children unvaccinated or under-vaccinated compared to pre-pandemic levels in 2019 [3]. About 40 per cent of unvaccinated or under-vaccinated children live in countries partially or fully affected by conflict. These children are often the most vulnerable to outbreaks of diseases such as measles and polio, which can lead to death or profound disability [4].

A study conducted in 16 conflict-affected countries reported that 14 of these countries have immunization coverage below the global average of 85% for diphtheria, pertussis and tetanus (DTP3). Six of the 16 countries have DTP3 coverage of less than 50%. The 16 countries concerned have more than 21 million affected people according to the UNHCR classification, of which 60% are internally displaced, 22% refugees and 18% are other UNHCR categories [5] .

In Burkina Faso, the security crisis has disrupted vaccination campaigns in regions plagued by terrorist attacks. The four regions most affected by the security crisis are the Centre-North, the East, the North and the Sahel. The 2023 report of the Ministry of Health showed that 14.7%; 14.6% and 18.9% of children were fully vaccinated in the Centre-Nord, Nord, and Sahel regions, respectively [6].

Despite ongoing interventions to strengthen immunization systems and adequately respond to emergency immunization during outbreaks, immunization-related indicators for SDG 3 lag in sub-Saharan Africa [7]. The Burkinabe Government, in its policy of reducing infant morbidity and mortality, has made vaccination one of the

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priorities of the Ministry of Health. This study aims to contribute to the achievement of Sustainable Development Goal 3 through target 3.2: By 2030, eliminate preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to no more than 12 per 1,000 live births and under-5 mortality to no more than 25 per 1,000 live births.

II. MATERIALS & METHODS

➢ *Study Design and Setting*

This was a descriptive, cross-sectional study using a questionnaire to determine factors associated with vaccination coverage among children living in insecure or conflict-affected areas of the Northern, Centre-North and Sahel regions of Burkina Faso.

➢ *Definition of Fully Vaccinated Child*

According to the World Health Organization (WHO), a child is fully vaccinated when they have received BCG (protection against tuberculosis), measles vaccine, three doses of polio vaccine, and three doses of PENTA. In addition, there is the yellow fever vaccine, in a single dose. According to the vaccination schedule, all these vaccines must be administered before the age of one year.

➢ *Target Population*

The population of this study concerned mother-child pairs under two years of age. According to the 2023 statistical yearbook of the Ministry of Health of Burkina Faso, about 417831 children under the age of two live in the three regions of Sahel, North and North Central Burkina Faso.

The sample size estimate was calculated using Raosoft software and was based on a 95% confidence level, a 5% margin error, and a 50% response distribution. The sample size required for this study is 384 mother-child pairs, or 128 participants per health region. The information was collected in the three regions of Sahel, North and North Central Burkina Faso using the simple random sampling method.

➢ *Data Collection Process*

Data collection was carried out using a questionnaire by 18 paramedical agents, i.e. six resident agents per health region (nurses and midwives), who were well trained via Teams on the questionnaire. A pilot study was conducted with 10% of the sample. The objective of the pilot study was to assess feasibility, time, cost, and adverse effects, and to improve the design of the study prior to conducting a large-scale research project. Data collection was conducted in French from April to June 2024.

➢ *Ethical Considerations*

This study received approval from the National Institute for Public Health Research ethics committee of Burkina Faso. Then, an authorization was obtained from health authorities to conduct this study. Also, a written consent form was submitted to each participant prior to data collection. The participants' data will remain confidential.

➢ *Data Analysis*

Data analysis was performed using SPSS 22 version software (SPSS Inc., Chicago, IL). Data analysis included descriptive statistics to estimate the frequency and percentage (%). Regression logistics was used to identify potential risk factors for low vaccination coverage in conflict zones. The level of significance considered will be set at $p < 0.05$ for all analyzes.

III. RESULTS

➢ *Socio-Demographic Characteristics of Participants*

A total of 384 mother pairs participated in this study. More than half (54.5%) of the children were girls and more than three-quarters (84.6%) were between the ages of 6 and 12 months. More than two-thirds (68.2%) of mothers were illiterate and more than three-quarters (83.3%) were housewives.

➢ *Vaccination Status of Children*

Regarding the vaccination status of children, the majority (96.6%) of mothers responded that their child was vaccinated. Nearly two-thirds (63.8%) of children had their vaccination records and vaccination coverage for measles and yellow fever was 45.3%. Fully vaccinated children were 28.4% (Table 1).

Table 1 Vaccination Status of Children

	Frequency	Percentage
Vaccinated Child		
Yes	371	96,6
No	13	3,4
Possession of a vaccination card		
Yes	245	63,8
No	139	36,2
Measles		
Yes	174	45,3
No	210	54,7
Yellow fever		
Yes	174	45,3
No	210	54,7
Fully vaccinated child		

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Yes	109	28,4
No	275	71,6

- *Risk Factors Associated with Incomplete Vaccination in Children under Two years of Age in Conflict Zones in Burkina Faso*

The regression logistic test using the adjusted method reported that the advanced age of the child, the young age of the mother, illiteracy, lack of possession of the vaccination card, inaccessibility of health services, the long distance to a health centre, the duration of the conflict, the displacement of families and the loss of a family member were risk factors ($p<$ 0,05)associated with incomplete vaccination in children under two years in conflict zones in Burkina Faso (Table 2).

Table 2 Risk Factors Associated with Incomplete Vaccination in Children under Two years of Age in Conflict Zones in Burkina Faso

Variable	**AOR (95% CI)**
Children's Demographic Information	
Sex of children	
Girl	0,42 (0,14 – 1,25)
Boy	Ref
Age of the child	
< 9 months	**0.22 (0.16 – 0.42)** [b]
9-12 months	0,74 (0,58 – 1,01)
13-23 months	Ref
Parent/Household/Conflict Information	
Mother's age	
<18	**1.29 (1.10 – 1.81)** [c]
18-35	1,11 (0,88 – 1,38)
36-49 years old	Ref
Marital status of mother	
Single	1,07 (0,49 – 2,32)
Married	Ref
Mother's education	
Illiterate	**2.36 (1.85 – 4.29)** [b]
Primary	1,86 (0,98 – 2,40)
Secondary or higher	Ref
Occupational status	
Housewife	1,20 (0,96 – 1,43)
Merchant	1,08 (0,90 – 1,30)
Worker	Ref
Possession of a vaccination card	
Yes	**0.75 (0.20 – 0.93)** [c]
No	Ref
Mothers' knowledge of immunization	
Good	0,86 (0,52 – 1,18)
Bad	Ref
Accessibility of services	
Yes	**0.89 (0.74 – 0.98)** [b]
No	Ref
Distance from the health center	
< 5 km	**0.82 (0.69 – 0.96)** [c]
5-9 Km	1,03 (0,83 – 1,20)
10 km and more	Ref
Duration of the conflict	
2 to 3 years	**3.74 (3.14 – 4.46)** [a]
4 to 5 years	Ref
Family Movement	
Yes	**1.52 (1.10 – 2.25)** [c]
No	Ref
Loss of a family member	
Yes	**1.18 (1.04 – 1.61)** [c]

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No	Ref
Note: *[a] = p <0.0001,* *[b] = p <0.001,* *[c] = <0.05; **AOR** = adjusted odds ratio, **CI** = 95% confidence interval significance, Ref=Reference*	

IV. DISCUSSION

In this study, less than a third of the children were fully vaccinated. Our results are similar to previous studies conducted in Sudan [8] and Somalia [9] where coverage rates for fully vaccinated children were 27.5% and 20%; respectively. In this study, the vaccination coverage for measles and yellow fever was minus 45.3%. Our results are below the global coverage of 83% coverage of the first dose of the measles vaccine. These figures are below the 95% coverage needed to prevent outbreaks, reduce deaths, and meet elimination targets [4]. The low measles coverage could be explained by the protracted conflict in the three country regions. This figure is further confirmed by the data reported by UNICEF on the coverage of less than 50% of PENTA3 and Measles 1 in the following countries, namely the Central African Republic, the Democratic People's Republic of Korea, Guinea, Papua New Guinea, Somalia, and Yemen [4].

Limited access to immunization services remains a major barrier to equity and expanding immunization coverage in many countries in sub-Saharan Africa [10]. In this study, about a quarter of households did not have access to health services and more than a quarter lived more than 5 km from a health centre. This inaccessibility and the long distance could explain the low vaccination coverage in the Centre-North, North and Sahel regions. A longer distance to the nearest health facility is associated with lower vaccination coverage and delayed vaccination [11]. Our findings are consistent with those of an earlier study conducted in Kenya that reported that travel time to immunization health centers is a barrier to vaccinating children in areas with insufficient accessibility. Strategies to remove barriers to access in the hardest-to-reach communities are needed to improve equitable access to immunization services [10].

The impact of conflict on immunization services is widely discussed in national planning documents and focuses mainly on reduced accessibility of services, lower coverage, increased risk of epidemics, destruction of health infrastructure and vaccine logistics, and depletion of human resources [5]. This study reported that fear of the presence of terrorists was the major reason for mothers not to bring the child to the vaccination sites. This study reported that the duration of conflict, family displacement, and loss of a family member were risk factors associated with incomplete vaccination among children under two years of age in conflict areas in Burkina Faso. This pattern is confirmed by a study conducted in northeastern Nigeria reporting that the conflict under Boko Haram had caused a lot of family displacement and loss of life [12].

Travel affects vaccination in a variety of ways. On the one hand, they can drastically reduce access to basic medical services when families flee their local health system. On the other hand, the concentration of displaced populations in designated locations, such as refugee or internally displaced persons camps, can make it easier for health workers to reach large numbers of infants eligible for vaccination [13].

Armed conflict can have a negative impact on health by undermining a country's health systems and access to prevention services. The impact of armed conflict could jeopardize and reverse all the progress made so far in controlling and eradicating vaccine-preventable diseases[14]. Low vaccination coverage in conflict-affected areas could be explained by the paralysis of existing health infrastructure, the forced displacement of families leading to an excessive burden of disease and deaths among this vulnerable population [2].

In addition to the presence of conflicts in the Northern, Central-North and Sahel regions of Burkina Faso, this study reported that the young age of the mother, illiteracy, and non-possession of a vaccination card were risk factors for low vaccination coverage among children. This figure is like that of previous studies conducted in Ethiopia which reported low vaccination coverage among young mothers, who were not in school and who had not kept their child's vaccination record [15]. Other studies further confirm our findings on the impact of education , the retention of vaccination records on childhood immunization coverage [16,17].

V. CONCLUSION

This study highlighted the impact of conflict on childhood immunization coverage. Low immunization coverage of children who are fully vaccinated has been reported in the three conflict-affected regions of Burkina Faso. This result provides clear policy recommendations on the importance of continuing to provide basic health services even in extreme circumstances such as conflict. These findings underscore the need to prioritize targeted interventions and vaccination programs in conflict areas in Burkina Faso.

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- *Authors' Contributions*

All authors participated in the conceptualization and the design of this manuscript. In addition, they provided essential comments for the data analyzes and the manuscripts. The co-authors have read and approved the final version for submission.

- *Competing Interests*

The authors declare that they have no competing interest in the preparation of this document.

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➢ *Consent for Publication*

There are no individual details, videos, or images used in this study. Therefore, consent to post is not applicable. Data was collected in the three regions namely Sahel, North and North Central of Burkina Faso. The datasets used for all analyzes in this study are available from the corresponding author.

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