

**ASSESSMENT OF KNOWLEDGE, ATTITUDES AND PRACTICES OF MOTHERS
REGARDING IMMUNIZATION TO CHILDREN 0–12 MONTHS IN BONASSAMA HEALTH
DISTRICT, DOUALA, CAMEROON**

Eric Epah^{1*}; Mbinta Fenibe James²; Atongno Humphrey Ashu³; Epie Ruphina⁴; Tarh Susan⁵

¹Principal Investigator and Main Author

²Supervisor

³President, Examination Panel

⁴Examiner

⁵Rapporteur

**Corresponding author: Eric Epah*

Manuscript prepared from the BSc Nursing dissertation submitted to the Department of Nursing, School of Health Sciences, BIAKA University Institute of Buea with supervision from the Faculty of Health Science of University of Beua

Authorship note. The author list above follows the user's requested inclusion of the supervisor and members of the examination panel as co-authors. For journal submission, the final author list should be confirmed against the target journal's authorship criteria and the actual scholarly contributions of each individual.

ABSTRACT

Background: Childhood immunization is a major public-health intervention for preventing vaccine-preventable diseases. Despite national and district vaccination strategies in Cameroon, incomplete and delayed vaccination remain concerns. This study assessed the knowledge, attitudes and practices of mothers regarding immunization of children aged 0–12 months in Bonassama Health District, Douala.

Methods: A community-based cross-sectional descriptive study was conducted among mothers/caregivers of children aged 0–12 months in selected communities of Bonassama Health District, including Mabanda, Centre Caise, Grand Hangar, Ngwelle, Ndobbo and Bonassama. The dissertation reports a planned sample of 400 after Cochran-based calculation and a convenience sampling approach. Data were collected using an interviewer-administered 42-item questionnaire covering socio-demographic characteristics, knowledge, attitudes and practices. Descriptive statistics and chi-square tests were used; the dissertation specified statistical significance at $P < 0.005$.

Results: The analyzed results report 392 correctly completed questionnaires in the main socio-demographic tables, although the data-collection narrative also reports 232 correctly returned questionnaires and a 1.50% non-response rate. Most children were male (51.3%), and the largest child age group was 10–12 months (27.6%). Most mothers were aged 25–30 years (44.4%), married (92.7%), had secondary education (56.5%), and were not formally employed (75.8%). Almost all mothers had heard of immunization (99.2%); 94.0% knew that immunization prevents childhood disease and 98.0% considered vaccines important for child health. Overall knowledge was categorized as good in 89.6% of respondents, with 5.2% each categorized as fair and poor in the cumulative knowledge table. Positive attitudes were common: 94.6% reported respecting the vaccination calendar, 91.0% felt secure after vaccination, and 92.0% were keen to complete multi-dose vaccination. Nevertheless, gaps remained: 18.0% believed vaccination should be stopped if fever occurred after vaccination, and 36.0% did not know that some vaccines are scheduled after nine months. Among children aged over nine months, 96.4% were reported as fully immunized and 3.6% as partially immunized. Vaccination cards showed delays and incomplete doses for some antigens; yellow fever had the highest reported proportion not vaccinated (10.7%). Maternal education, marital status, resident community, religion, and maternal and paternal childhood immunization history were reported to be significantly associated with knowledge ($P < 0.05$), while maternal occupation was not ($P = 0.069$).

Conclusion: Mothers in Bonassama Health District demonstrated generally good knowledge and favorable attitudes toward childhood immunization, but knowledge did not consistently translate into timely and complete vaccination practices. Targeted health education, appointment reminders, reduction of waiting times, improved communication about multi-dose schedules and continued community-based promotion are warranted.

Keywords: immunization; vaccination; mothers; knowledge; attitudes; practices; children; Bonassama; Douala; Cameroon.

1. INTRODUCTION

1.1 Background

Immunization is the process through which a person is made immune or resistant to an infectious disease, typically through administration of a vaccine. Vaccines stimulate the body's immune system to protect against subsequent infection or disease. The dissertation describes immunization as one of the major and cost-effective public-health measures for preventing childhood morbidity and mortality.

The World Health Organization launched the Expanded Programme on Immunization (EPI) in 1974 with the aim of expanding childhood vaccination worldwide. The dissertation notes that, in the early years of the programme, protection against the principal childhood vaccine-preventable diseases was

limited, whereas coverage subsequently increased substantially in many settings. It further reports the commonly cited estimate that vaccination prevents approximately 2–3 million infant deaths each year. Cameroon's EPI began in 1976 as a pilot programme targeting infants. The dissertation describes a progressively expanded vaccine portfolio, including vaccines against tuberculosis, diphtheria, tetanus, poliomyelitis, pertussis, hepatitis B, *Haemophilus influenzae* type b, pneumococcal disease, rotavirus diarrhoea, measles and yellow fever, among others. It emphasizes that protection depends not only on receiving vaccines but also on receiving all required doses at the recommended ages.

1.2 Problem statement

The dissertation reports that Cameroon had adopted several strategies to improve immunization coverage, including fixed vaccination posts, outreach, mobile vaccination and supplementary activities. However, access and completion remained challenges. The background cited national evidence in which only 53% of children aged 12–23 months were completely vaccinated, 5% had received no EPI antigen and 42% were partially vaccinated. These historical figures were used in the dissertation to motivate assessment of maternal knowledge, attitudes and practices in Bonassama Health District.

1.3 Study objective

The general objective was to assess the knowledge, attitudes and practices of mothers towards immunization of children aged 0–12 months in Bonassama Health District. Specific objectives were to assess maternal knowledge, attitudes and practices and to examine the relationship between maternal educational level and knowledge of childhood vaccination.

1.4 Research question and hypothesis

The study asked whether mothers of children of vaccination age had adequate knowledge and good practices regarding immunization and why vaccination coverage in Bonassama Health District was not 100%. The stated alternative hypothesis was that mothers had adequate knowledge, good attitudes and appropriate practices regarding immunization.

2. LITERATURE REVIEW

The dissertation reviewed evidence from Ethiopia, Saudi Arabia, Nigeria, India, Iraq and Pakistan. In Addis Ababa, the reviewed study reported good knowledge in 55.0%, positive attitude in 53.8% and good practice in 84.0% of respondents, with maternal education and other factors associated with favorable outcomes. A Saudi Arabian study reported good general knowledge among 91.9% of parents but identified gaps concerning multiple vaccine doses, simultaneous vaccination, seasonal influenza and contraindications. A Nigerian study among mothers of children aged 0–12 months reported 89.6% overall good knowledge, while fewer than 60% reported vaccination at the stipulated time.

The dissertation also reviewed an Indian study in which incomplete immunization affected 30.5% of children and maternal education and residence were associated with knowledge. An Iraqi study identified different parental acceptance profiles and reported that 73% of children were immunized on time. A study from rural Pakistan found high awareness and generally favorable perceptions of childhood immunization. Collectively, the reviewed studies supported the importance of maternal knowledge, education, communication and health-service factors in vaccination uptake.

3. METHODS

3.1 Study design and setting

This was a community-based cross-sectional descriptive study conducted in selected communities within Bonassama Health District in Douala. The communities identified in the dissertation were

Mabanda, Centre Caise, Grand Hangar, Ngwelle, Ndobo and Bonassama. The study was intended to provide information on mothers of children in the active vaccination age range of 0–12 months.

3.2 Study population and eligibility

The target population comprised mothers/caregivers of children aged 0–12 months. Inclusion criteria were mothers/caregivers with children aged 0–12 months, those attending immunization clinics in public or private health units within Bonassama Health District, willingness to participate, and ability to communicate in French, English or Pidgin. Exclusion criteria included unwillingness to participate, unavailability during data collection, inability to understand/read the stated study languages, and having a child older than 12 months.

3.3 Sample size and sampling

The dissertation used the Cochran formula with a 95% confidence level, 5% margin of error and an assumed prevalence of 64.3% based on a cited study from Djoungolo Health District. The calculation yielded 352 participants; adding a 10% non-response allowance produced an estimated 387, and the planned sample was increased to 400 to reduce the margin of error. Participants were selected using convenience sampling.

3.4 Data collection instrument and procedure

Data were collected using a structured 42-item questionnaire administered by interview. The questionnaire comprised four sections: socio-demographic characteristics; maternal knowledge of immunization; attitudes toward immunization; and practices concerning childhood immunization. The instrument also captured immunization-card information and reasons for missed vaccination sessions. The dissertation states that data collection was conducted from April to May 2019 by trained research assistants.

3.5 Variables and analysis

The dependent variables were maternal knowledge, attitude and practice regarding immunization. Explanatory variables included maternal age, religion, education, occupation, family income/household characteristics and number of children, together with other demographic characteristics recorded in the questionnaire. The dissertation reports use of EpiData 3.53 for data entry and SPSS version 21 for analysis. Frequencies, percentages, means and standard deviations were used for descriptive analysis; chi-square testing was used to examine associations between knowledge and demographic characteristics; and linear correlation was planned for relationships between knowledge and attitude. The dissertation states a significance threshold of $P < 0.005$.

3.6 Ethical considerations

The dissertation reports that administrative authorization and ethical clearance were to be obtained from the relevant institutional/ethical authorities. Written informed consent was obtained from participants who agreed to participate; verbal consent was used for participants who could not read and write after receiving study information. Confidentiality of collected information was emphasized.

4. RESULTS

4.1 Participant and child characteristics

The data-collection narrative states that 398 questionnaires were prepared and 232 were correctly completed and returned, with six improperly completed questionnaires and a stated non-response rate of 1.50%. However, the subsequent results tables use $N=392$ for the main demographic, knowledge and practice analyses. Because the source dissertation contains this internal discrepancy, the present manuscript reports the frequencies and percentages exactly as presented in the results tables and flags the discrepancy rather than silently recalculating or substituting values.

Sex of child	n	%
Male	201	51.3
Female	191	48.7

Child age	n	%
<1 month	76	19.3
1–3 months	64	16.3
4–6 months	38	9.6
7–9 months	106	27.0
10–12 months	108	27.6

Maternal age	n	%
<25 years	83	21.2
25–30 years	174	44.4
31–40 years	120	30.6
>40 years	15	3.8

Marital status	n	%
Single/separated/divorced/widowed	29	7.3
Married	363	92.7

Maternal education	n	%
None	15	3.9
Primary	47	12.1
Secondary	222	56.5
University	108	27.6

Occupation	n	%
Employed	41	10.4
Not employed	297	75.8
Student	54	13.8

Most mothers were married and had at least secondary education. The dissertation reports that 83.6% of mothers had themselves been immunized during childhood, compared with 60.3% of fathers; 34.5% of fathers could not determine whether they had been vaccinated.

4.2 Maternal knowledge of immunization

Knowledge item	Yes n (%)	No n (%)	Don't know n (%)
Heard about immunization	389 (99.2)	2 (0.4)	2 (0.4)
Immunization prevents childhood disease	368 (94.0)	9 (2.2)	15 (3.9)

Vaccines are important to child health	384 (98.0)	2 (0.3)	6 (1.7)
Vaccination reduces probability of death/illness	361 (92.0)	24 (4.1)	15 (3.9)
Immunization has a role in child health	341 (87.0)	24 (6.0)	27 (7.0)
Vaccines differ and are given at different ages	212 (54.0)	149 (38.0)	31 (8.0)
Vaccines may have side effects such as fever	263 (67.0)	125 (32.0)	4 (1.0)
Low-grade fever/diarrhea are contraindications	278 (71.0)	44 (12.0)	67 (17.0)
Healthy children still need vaccination	349 (87.0)	8 (2.0)	35 (9.0)
Vaccines are given once every month	47 (12.0)	310 (79.0)	35 (9.0)
BCG is given at six weeks	39 (10.0)	341 (87.0)	12 (3.0)
Stop vaccination if child develops fever	70 (18.0)	306 (78.0)	15 (4.0)
Some vaccines are administered after 9 months	251 (64.0)	31 (8.0)	110 (28.0)

Mass media was the most frequently reported information source (62%), followed by interpersonal sources (36%); 2% reported never having heard information through the listed sources. Overall, the cumulative knowledge table classified 208 respondents (89.6%) as having good knowledge, 12 (5.2%) as fair and 12 (5.2%) as poor. The dissertation further states that only 18 mothers (4.59%) demonstrated excellent knowledge in identifying vaccines according to the child's age.

4.3 Maternal attitudes

Attitude item	Yes/positive n (%)	No/negative n (%)	Don't know/other n (%)
Given mandatory vaccines appropriate for age	370 (94.38)	16 (4.08)	6 (1.53)
Respect EPI calendar and appointments	371 (94.6)	15 (3.8)	6 (1.5)
Feel secure after vaccination	357 (91.0)	31 (8.0) afraid	4 (1.0)
Advise friends/relatives to vaccinate	206 (52.5)	48 (12.3)	138 (35.2)
Keen to complete all vaccine doses	361 (92.0)	24 (4.1)	15 (3.9)
Make time to accompany child on appointment days	331 (84.4)	45 (11.4)	16 (4.2)
Stopped vaccination after fever from previous vaccine	12 (3.0)	380 (97.0)	0

For reminders, 85.2% reported using the vaccination calendar, 12% relied on their husband and 2.8% did not know. When a vaccination session was missed, 77.5% said they would return immediately for vaccination, 5.2% would skip the dose and 17.3% did not know. Among the 14 children described as partially immunized after nine months, the most commonly reported reasons for missed sessions were mothers being too busy and long queues/waiting time (each 21.4%), followed by vaccine unavailability and child illness (each 14.2%).

4.4 Maternal vaccination practices and child immunization status

Practice/status	n (%)	n (%)	n (%)
Adhere to child's immunization schedule	363 (82.6)	11 (2.8)	18 (14.6)
Confirm BCG by observing BCG mark	361 (92.0)	—	31 (8.0)

Have EPI vaccination card	328 (83.6)	48 (12.2)	16 (4.2)
Received tetanus toxoid during pregnancy	372 (95.0)	6 (1.5)	14 (3.5)
Children <9 months: all age-appropriate vaccines	381 (97.0)	11 (3.0)	—
Children >9 months: fully immunized	378 (96.4)	14 (3.6) partially	—

Among the 108 children aged 10 months and above, the dissertation's vaccination-card review classified vaccines according to whether they were received at the stipulated time, received late, known from maternal history, incomplete or not received. About 65.3% were reported to have received BCG at the stipulated time, while 40.5% received DPT at the stipulated time, 39.7% hepatitis vaccine, 40.1% OPV, 50.0% measles and 48.3% yellow fever. Incomplete doses were reported for DPT (7.8%), hepatitis (9.9%) and OPV (8.6%). Yellow fever had the highest reported proportion not vaccinated (10.7%).

4.5 Factors associated with maternal knowledge

Characteristic	χ^2	P value	Interpretation
Sex	0.486	0.784	Not significant
Mother's age	3.722	0.714	Not significant
Marital status	14.766	0.001	Significant
Mother's education	22.846	0.001	Significant
Resident community	46.747	<0.001	Significant
Mother's occupation	14.540	0.069	Not significant
Religion	24.324	<0.001	Significant
Mother immunized as child	31.933	<0.001	Significant
Father immunized as child	27.757	<0.001	Significant

The dissertation reports that higher maternal education was associated with higher knowledge. Marital status, community of residence, religion, maternal childhood immunization and paternal childhood immunization were also significantly associated with knowledge. Maternal age, sex and occupation were not statistically significant in the reported analyses.

5. DISCUSSION

5.1 Knowledge

The study found a high overall level of maternal knowledge: 99.2% had heard about immunization, 94.0% recognized its role in preventing childhood disease and 98.0% considered vaccines important to child health. The cumulative knowledge classification identified 89.6% as having good knowledge. This finding is similar to the 89.6% good knowledge reported in the Nigerian study reviewed in the dissertation, but differs from the lower knowledge proportions reported in the Addis Ababa study.

Despite high general awareness, important knowledge gaps were evident. Only 54% reported knowing that vaccines are different and administered at different ages, 67% recognized fever as a possible vaccine side effect, and 64% knew that some vaccines are administered after nine months. Eighteen percent believed vaccination should be stopped after fever following vaccination. These findings indicate that general awareness of immunization is not equivalent to detailed understanding of the vaccination schedule and management of expected post-vaccination events.

5.2 Attitudes and missed appointments

Attitudes were generally favorable. More than 90% reported respecting the vaccination calendar, feeling secure after vaccination and being willing to complete multi-dose schedules. However, only 52.5% reported advising friends and relatives to vaccinate their children, while 35.2% gave an 'I don't know' response to this item. The reasons given for missed sessions—especially competing maternal demands, long waiting times, vaccine unavailability and child illness—suggest that barriers to vaccination were not purely attitudinal.

5.3 Practices and immunization status

Reported practice was favorable for many indicators, including possession of an EPI card, adherence to schedules and completion of age-appropriate vaccines among children below nine months. Nevertheless, the vaccination-card review demonstrated delays and incomplete doses. The dissertation therefore concludes that knowledge does not necessarily translate into timely practice. The finding is consistent with the literature reviewed in the dissertation, including evidence from Nigeria showing that good knowledge can coexist with lower rates of vaccination at the stipulated time.

5.4 Socio-demographic influences

Maternal education was strongly associated with knowledge, with knowledge increasing as educational attainment increased. The dissertation interprets this as reflecting greater ability to obtain and process health information. Marital status, community of residence, religion and parents' own immunization histories were also significantly associated with maternal knowledge. These relationships suggest that immunization education should be tailored to the social and educational context of mothers rather than relying solely on generalized messages.

6. STRENGTHS AND LIMITATIONS

Strengths include assessment of all three KAP domains, inclusion of multiple communities within Bonassama Health District, and review of vaccination-card information for older infants. The study also examined socio-demographic correlates of maternal knowledge.

Important limitations arise from the source dissertation. First, the reported sample size is internally inconsistent: the data-collection narrative states that 232 questionnaires were correctly completed and returned, whereas the principal results tables use N=392. Second, the dissertation uses both descriptive and analytical terminology for a study described in the methods as cross-sectional descriptive. Third, the manuscript retains the dissertation's reported statistical threshold and results rather than independently reanalyzing the raw dataset. Fourth, convenience sampling limits representativeness and may introduce selection bias. Finally, some vaccination practices were based on maternal report, which may introduce recall or social-desirability bias.

7. PUBLIC HEALTH AND NURSING IMPLICATIONS

The findings support strengthening routine health education during antenatal, postnatal and immunization contacts. Nurses and other vaccinators should emphasize the full vaccination schedule, the importance of completing multi-dose series, expected vaccine reactions and what mothers should do when a child is ill or an appointment is missed. Reminder systems using vaccination cards, interpersonal communication and mass media may improve timeliness. Service-delivery improvements should also address long queues and waiting times and communicate clearly when vaccines are temporarily unavailable.

Because knowledge differed by maternal education and community of residence, targeted community education may be particularly useful in settings with lower educational attainment or poorer access to routine health information. Engagement of fathers, families and community-level actors may also

reinforce adherence, given the observed associations between parental immunization histories and maternal knowledge.

8. RECOMMENDATIONS

1. Increase radio and other mass-media messages, including messages in locally understood languages, on the vaccination schedule and the vaccines due at different ages.
2. Develop and distribute clear flyers, posters and community information materials on immunization and the importance of completing all doses.
3. Engage traditional birth attendants and community actors in immunization education and referral, including education concerning tetanus prevention.
4. Strengthen use of immunization cards as practical reminders and reinforce counseling when a child misses an appointment.
5. Reduce avoidable waiting times at vaccination points and improve communication with mothers when vaccines are temporarily unavailable.
6. Conduct similar studies in other health districts and publish findings to support local decision-making and immunization programming.
7. Give additional attention to communities with poorer access and to mothers with lower educational attainment.

9. CONCLUSION

Within the limits of the reported data, mothers in Bonassama Health District demonstrated generally good knowledge and favorable attitudes toward childhood immunization. However, detailed knowledge gaps remained regarding vaccine schedules, post-vaccination fever and vaccines administered after nine months. Although most mothers reported favorable vaccination practices and most older infants were classified as fully immunized, vaccination-card review identified delayed and incomplete doses. Maternal education, marital status, community of residence, religion and parental childhood immunization histories were significantly associated with maternal knowledge. The findings support continued and targeted health promotion combined with practical improvements in vaccination service delivery.

10. DECLARATIONS

Ethics approval and consent to participate: The dissertation reports that ethical/administrative approval was sought from relevant institutional authorities and that informed consent was obtained from participating mothers/caregivers.

Consent for publication: Not applicable to aggregated study findings.

Availability of data: The present manuscript is based on the dissertation dataset. The raw dataset was not supplied with the source document and is therefore not reproduced here.

Competing interests: No competing interests were reported in the dissertation.

Funding: The dissertation budget was presented as an academic research budget; no external funding source was identified in the supplied work.

Authors' contributions: Eric Epah conceived and conducted the study and prepared the dissertation. The supervisor and examination-panel members are listed as co-authors in accordance with the user's requested authorship arrangement. Before journal submission, each named co-author should confirm and document their actual contribution and approve the final manuscript.

Acknowledgements: The author acknowledges the academic and institutional support associated with the BSc Nursing dissertation and the mothers/caregivers who participated in the study.

REFERENCES

1. Muhsen K, Abed El-Hai R, Amit-Aharon A, Nehama H, Gondia M, Davidovitch N, et al. Risk factors of underutilization of childhood immunizations in ultraorthodox Jewish communities in Israel despite high access to health care services. *Vaccine*. 2012;30(12):2109–2115. doi:10.1016/j.vaccine.2012.01.044.
2. Bos E, Batson A. Using immunization coverage rates for monitoring health sector performance: measurement and interpretation issues. 2000.
3. World Health Organization. Together we can close the immunization gap. WHO; 2016.
4. Lernout T, Theeten H, Hens N, Braeckman T, Roelants M, Hoppenbrouwers K, et al. Timeliness of infant vaccination and factors related with delay in Flanders, Belgium. *Vaccine*. 2014;32(2):284–289. doi:10.1016/j.vaccine.2013.10.084.
5. Ba Pouth SFB, Kazambu D, Delissaint D, Kobela M. Immunization coverage and factors associated with drop-out in children 12 to 23 months in Djoungolo-Cameroon Health District in 2012. *Pan Afr Med J*. 2014;4:17.
6. Hu Y, Chen Y, Guo J, Tang X, Shen L. Completeness and timeliness of vaccination and determinants for low and late uptake among young children in eastern China. *Hum Vaccin Immunother*. 2014;10(5):1408–1415.
7. Torun SD, Bakırcı N. Vaccination coverage and reasons for non-vaccination in a district of Istanbul. *BMC Public Health*. 2006;6:125. doi:10.1186/1471-2458-6-125.
8. Bofarraj AMM. Knowledge, attitude and practices of mothers regarding immunization of infants and preschool children at Al-Beida City, Libya. 2008.
9. Barreto TV, Rodrigues LC. Factors influencing childhood immunisation in an urban area of Brazil. *J Epidemiol Community Health*. 1992;46(4):357–361. doi:10.1136/jech.46.4.357.
10. Chidiebere ODI, Uchenna E, Kenechi OS. Maternal sociodemographic factors that influence full child immunisation uptake in Nigeria. *South Afr J Child Health*. 2014;8(4):138–142. doi:10.7196/sajch.661.
11. Antai D. Inequitable childhood immunization uptake in Nigeria: a multilevel analysis of individual and contextual determinants. *BMC Infect Dis*. 2009;9:181.
12. World Health Organization. The Expanded Programme on Immunization (EPI) survey. WHO/EPI/MLM/91.10. 1991.
13. World Health Organization. Immunization. WHO; 2013.
14. Angelillo IF, Ricciardi G, Rossi P, Pantisano P, Langiano E, Pavia M. Mothers and vaccination: knowledge, attitudes, and behaviour in Italy. *Bull World Health Organ*. 1999;77(3):225–228.

EDITORIAL NOTE FOR JOURNAL SUBMISSION

The supplied dissertation contains internal numerical inconsistencies that should be resolved against the original dataset before submission to a peer-reviewed journal. Most notably, the data-collection narrative reports 232 correctly completed questionnaires, while the results tables use N=392; the cumulative knowledge table also presents 232 as its total while using percentages derived from the same broader dataset. The manuscript has preserved the reported values and explicitly flagged the discrepancy rather than inventing a reconciliation. The final journal version should use the verified denominator from the original dataset and rerun all percentages and inferential statistics if the raw data are available.