NIGERIAN JOURNAL OF PAEDIATRICS

https://www.njpaediatrics.com

PRINT: ISSN 0302-4660

ONLINE: ISSN 2814-2985

OFFICIAL JOURNAL OF THE PAEDIATRIC ASSOCIATION OF NIGERIA

VOLUME 52
NUMBER 2
APRIL - JUNE 2025

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Nigerian Journal of Paediatrics 2025 (April-June); Volume 52(2): 152-160.
https://dx.doi.org/10.63270/njp.2025.v52.i2.2000017

Building Capacity Using Online Courses in Low- and Middle-Income Countries: A Report of the Paediatric Association of Nigeria Adverse Events Following Immunization Online Course

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Abstract

Background: Adverse events following Immunisation (AEFIs) are a significant reason for vaccine hesitancy globally. The handling of an AEFI occurrence has implications not only for the patient but also for the immunisation program.

Objective: To evaluate the use of online capacity building on AEFI management, AEFI reporting and crisis communication among doctors.

Methods: The Paediatric Association of Nigeria experts on immunisation developed a curriculum for the four-week course consisting of four modules. Each module was delivered through scheduled weekly 90-minute Zoom meetings, consisting of didactic lectures and breakout interactive sessions. During these sessions, case studies were used to illustrate the lecture content. The evaluation was conducted through pre- and post-test online assessments.

Results: Three courses were held in February, April and June of 2023. Attendance for each module ranged between 63 and 269 persons. Of 198 respondents, 30.3% (60/198) had received previous training on AEFI, 59.7% (151/198) had managed at least one case of AEFI, and only 13.4% (34/198) had ever reported one. The mean scores for the pre-test ranged from 1.14 to 3.05, while the post-test scores ranged from 2.16 to 3.88. There was a statistically significant improvement in scores between the pre-test and post-test for most modules. Improved knowledge was reported by 92.4% (171/185) after the training. Confidence in discussing AEFI with parents/caregivers increased to 98.4% (182/185) after the training, compared to 33% (61/185) at the beginning ($p < 0.0001$).

Conclusion: The AEFI online course successfully achieved capacity building among doctors in the management, reporting, and communication of AEFI.

Keywords: Adverse events, Capacity building, Immunization, Vaccine hesitancy.

Introduction

An adverse event following immunisation (AEFI) is any untoward medical occurrence that follows immunisation, which does not necessarily have a causal relationship with the use of the vaccine (including all processes that occur after a vaccine product has left the manufacturing or packaging site – handling, prescribing, and administration of the vaccine).[1] The handling of the occurrence of an AEFI has implications not only for the patient but also for the immunisation programme. The fear of AEFIs has been reported as a significant reason for vaccine hesitancy and rejection of immunisation internationally and in Nigeria. [2-4] They have assumed increasing importance in recent years, especially following the deployment of COVID-19 vaccines.

In a survey conducted by the Paediatric Association of Nigeria and the American Academy of Pediatrics (unpublished) to investigate the content and quality of immunisation services in relation to vaccine knowledge, amongst other factors in health care workers, a major finding which was reiterated in a human-centred design workshop to address the problems of immunisation was that doctors were not comfortable with discussions on adverse events following immunisation (AEFI). The suggested solutions by the doctors included training on AEFI and the development of easily accessible job aids. Indeed, a scoping of the country's immunisation activities indicates that although trainings on immunisation, including AEFIs, do take place, doctors are underrepresented in these trainings. These trainings target health workers who provide immunisation services, whereas nurses and community health extension workers typically administer vaccinations. [5] Previous studies have also reported a lack of confidence among healthcare workers in communicating with parents who are hesitant about vaccines.[6,7]

Health workers, especially doctors, have often been identified as essential sources of immunisation information by parents and caregivers.[8] Evidence shows that the quality of interaction between frontline healthcare workers and caregivers regarding vaccination is a key factor in vaccine acceptance and in ensuring the completion of the vaccination schedule.[9] Additionally, severe AEFIs are typically managed by doctors. As the heads of most healthcare teams in Nigeria and many low-income countries, they must possess the skills to handle AEFIs, not only in terms of clinical management but also in AEFI reporting and crisis communication.

Reports on knowledge about AEFIs and reporting are variable. Some studies report good knowledge, while others report suboptimal knowledge. [10-14] The majority of studies, however, report suboptimal practices in the reporting of AEFIs, with a few reporting

acceptable levels of reporting. Many studies in Nigeria have a very low representation of doctors in the study population, as they focus on healthcare workers who provide immunisation or those working in primary care facilities. [10,12] While mild cases of AEFIs are likely to present in immunisation clinics and primary healthcare facilities, serious AEFIs are more likely to be seen in secondary and tertiary care facilities, where they would be cared for by doctors.

In an Albanian study, paediatricians were reported to have had lower knowledge scores compared to other physicians, and they were less likely to report AEFIs. [13] A Nigerian study reported no significant difference between doctors and non-doctors in terms of knowledge and reporting of AEFIs; the doctors only constituted 12.3% of the sample size which may explain the lack of significant difference.[15] Several factors have been reported as predictors of reporting practice. These include work experience, knowledge of AEFI and Training. [10,16] Studies which identified suboptimal reporting recommended capacity building as a solution. [13,17] Capacity building is defined as the process of developing and strengthening the skills, instincts, abilities, processes and resources that organisations and communities need to survive, adapt and thrive in a fast-changing world.[18] Traditionally, this has involved training and education, often accomplished physically. However, since the advent of COVID-19, many activities have now shifted to online platforms.

Previous studies have shown the acceptability and effectiveness of online learning. [19, 20] A systematic review of massive open online courses concluded that online courses can be an effective tool to support the education of healthcare workers in low- and middle-income countries. This article reports on the Nigerian experience in utilising an online platform to enhance the capacity of doctors in addressing AEFI.

Methods

Study design

A quasi-experimental design was adopted.

Study population

Only doctors.

Sampling technique

All the doctors who enrolled for the courses.

Ethics

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Data collection

A curriculum for the AEFI online course was developed by PAN experts on immunisation. It consisted of four modules: Introduction to Adverse Events Following Immunisation, Management of Adverse Events Following Immunisation, Reporting and Investigating Adverse Events Following Immunisation, and Adverse Events Following Immunisation Data Management. Each module consisted of didactic lectures and breakout interactive sessions, during which case studies were used to illustrate the content of the didactic lectures.

Each AEFI online course was conducted over four weeks (one module per week). Each module was delivered through scheduled weekly 90-minute-long Zoom meetings. The online course was run in alternate months: February, April and June 2023. The course was certificated and attracted six CME credits on completion of all four modules. Certificates were awarded to participants who completed at least three modules (modules 2, 3, and 4), as the first module was introductory, and most of the concepts were repeated in subsequent modules.

Each four-week course was evaluated using a pre-course evaluation form completed at enrolment, pre-and post-test questions (five questions for each module), and a post-course evaluation form completed at the end of the course. Each correct answer earned a score of 1, with a maximum score of 5 for each module. All forms were in Google Forms format, and the data was in Excel format.

Data analysis

The data were de-identified and exported into an SPSS version 21 spreadsheet, and the same software was used for analysis. The mean scores for the pre-and post-test assessments were calculated and compared using the Student's t-test. The association between variables was determined using the Chi-Square test. The difference between the mean scores was tested using the Student's t-test. The level of significance for all statistical tests was set at $p < 0.05$, with a 95% confidence interval.

Results

Three courses took place in February, April and June of 2023. Attendance for each module ranged from 63 persons for Module 4 of the first course to 269 for Module 1 of the last course. Attendance increased from an average of 67.75 in the first course to 234.75 in the June course. One hundred and ninety-eight persons completed the course (Table I).

Table I: Number of attendees at each of the webinars

Module	February	April	June	Total
Module One	67	71	269	407
Module Two	77	92	238	407
Module Three	64	83	221	368
Module Four	63	75	211	349
Completed Course	28	22	148	198

Of 198 respondents, only 60 (30.3%) had ever received training on AEFI. While 151 (59.7%) had ever managed a case of AEFI, only 34 (13.4%) had ever reported one. Table II displays the knowledge scores before and after each module. The mean scores for the pre-test ranged from 1.14 to 3.05, while the post-test scores ranged from 2.16 to 3.88. There was a statistically significant improvement in scores between the pre-test and post-test for most modules. The least improvement was seen for modules 3 and 4.

Table II: Mean scores pre-and post-test for each module

Module	Mean Pre-Test Score ± SD	Mean Post-Test Score ± SD	p-value
February Online Course			
Module 1	2.91 ±1.01	3.8 ±1.05	<0.001
Module 2	1.14 ±0.95	2.16 ±1.17	<0.001
Module 3	3.16±0.80	3.72±0.90	0.0371
Module 4	1.86±1.11	2.17±1.12	0.289
April Online Course			
Module 1	3.03±0.97	3.88±0.95	<0.0001
Module 2	2.13±1.24	3.62±1.15	<0.0001
Module 3	3.05±0.97	3.68± 0.91	0.0023
Module 4	1.91±1.06	3.08±1.55	0.0002
June Online Course			
Module 1	2.8± 0.87	3.67±1.02	<0.0001
Module 2	2.43±1.029	3.64± 1.09	0.0004
Module 3	2.92±0.95	3.67±0.93	<0.0001
Module 4	2.08±1.09	2.48±1.19	0.0031

The total score for each module is 5

Table III: Effect of training on the level of participants' confidence in discussing AEFI with parents/caregivers

Level of Confidence	Pre-Course	Post-Course	X^2	p-value
Not confident	85	2		
Somewhat confident	86	1	219.98	<0.0001
Confident/Very confident	61	182		

Table IV: Perception of participants on the effect of the course on their knowledge

Scale of Improvement	n	Percentage
1	2	1.1
2	0	0.0
3	12	6.5
4	66	35.6
5	105	56.8

A score of 1 is the lowest, and 5 the highest

Figure 1 shows that Module 2 was considered most useful by 97 respondents (52.4%), while Module 4 was considered most useful by 13 respondents (7.0%). The impact of the training on the level of confidence respondents have in communicating about AEFIs and their knowledge, as assessed by the respondents, is presented in Tables III and IV. The majority of the respondents felt that the training improved their confidence and expertise.

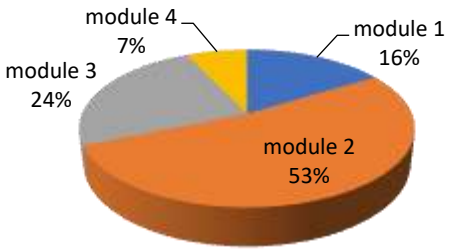

Figure 1: Perception of respondents about usefulness of modules

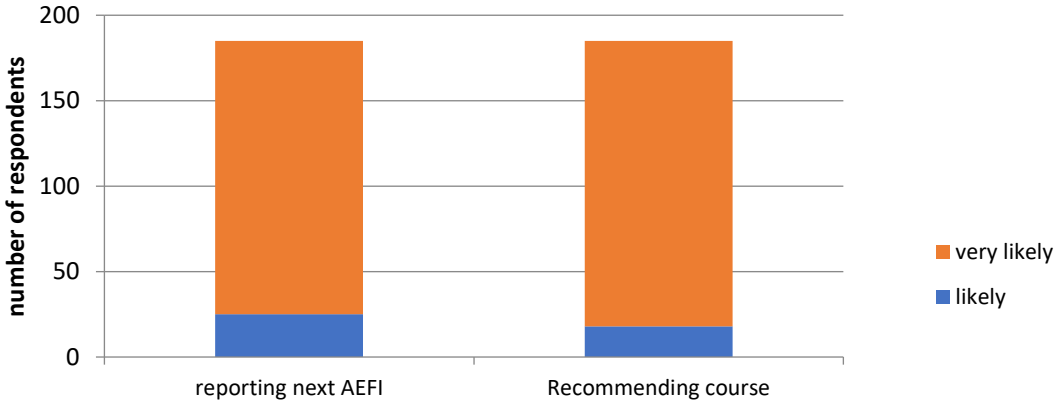

Figure 2: Likelihood of respondents reporting their next AEFI and recommending the AEFI course

The likelihood of respondents reporting their next case of AEFI is shown in Figure 2. The majority (160; 86.5%) would likely report the next case of AEFI. Additionally, 167 (90.3%) respondents would likely or most likely recommend the course to a colleague.

Discussion

Vaccine safety and surveillance are essential aspects of immunisation services, which are needed to ensure vaccine safety, as pre-licensure studies may not identify rare side effects of vaccines. In this study, only about a third of participants had ever received training on AEFIs.

This is significantly lower than the reported values for many Nigerian studies. [12, 14, 15] This is likely because this study focuses on doctors, in contrast to previous studies that focused on healthcare workers working at primary healthcare facilities and immunisation clinics. The latter receive regular training on immunisation and AEFIs, especially during the introduction of new vaccines and during supplemental immunisation activities. Doctors working at the primary healthcare level and involved in immunisation activities at this level are few. Every doctor who manages children should be familiar with AEFI reporting protocols and possess a good understanding of the clinical features of AEFIs. Training at various levels, including pre-service, supportive supervision, workshops, and personal development, should be utilised to achieve this objective.

Almost 60% of the respondents had managed a case of AEFI, indicating that AEFIs are relatively common. This is similar to reports from various studies (70% by Mehmeti *et al.* [13] and 66% by Mohammed *et al.* [14]) though higher than the rate of 32.9% reported by Sani *et al.* [12] from Sokoto and 33.5% reported by Ogunyemi and Odusanya [15] in Lagos. However, only about 13% of the respondents in this study had ever reported a case. This is much lower than reported in Albania, China, and some Nigerian studies. [12, 13, 15, 21] Such gross under-reporting has potential consequences, as it does not allow safety concerns to be addressed in a timely fashion. This may negatively impact on demand and coverage of immunisation.

The mean pre-training scores of the participants for each module indicate that the lowest scores were for the module on data management. This is likely because most doctors are not involved in this and probably do not think it is essential for them to know about how reported data on AEFI is handled. This module also had the least improvement following training. The lowest number of respondents rated this module as the most useful compared to the module on case management. The module on case management was considered most useful by many respondents, as the majority had previously managed AEFIs, and it offered information on managing cases of AEFI. The majority of respondents are clinical staff who manage patients and may have found this module more relevant to their clinical work. Just under a quarter of the respondents considered the module on the investigation and reporting of AEFIs as the most useful. This is likely because they must have felt that they did not have very active roles other than to report the case. This suggests a further need to emphasise the importance of investigating, reporting and data management of AEFI.

Many studies on AEFI do not address the communication needs of healthcare workers in handling AEFIs. This is particularly important, as the handling of communication about an AEFI case can negatively impact vaccine confidence if not properly managed. The majority of the doctors in the present study were not confident about discussing AEFI before training. This is similar to a finding in Switzerland, where only 43% of physicians, most of whom worked in paediatrics, felt comfortable counselling vaccine-hesitant patients. [22] There was a marked improvement in the self-perceived level of confidence following the training. The training also achieved the objective of improving knowledge, evidenced by the statistically significant improvement in knowledge scores for most modules post-training. Self-perceived improvement in knowledge also indicates that knowledge was imparted. The majority of doctors who registered and started the course did not complete it despite having the opportunity to accumulate modules attended from earlier courses. This is similar to the International Paediatric Association (IPA)'s online course, in

which only 51.1% of those who started the course completed it.[23] It is also similar to the completion rate in a training on COVID in Nigeria. [19] One of the major challenges for participants was an unstable telephone network. Others complained about the timing of the meetings; this could have been mitigated by using a self-paced learning approach, but even the IPA course, which was self-paced, only achieved marginally higher completion rates. Other strategies are thus needed to ensure better completion rates of online courses.

The majority of the participants rated the facilitators, content, interactive sessions and case scenarios very highly. Only a small proportion (3.2%) rated the interactions as being average. This may be due to the absence of the one-on-one component, as found in face-to-face training models, and also because of the large classes, despite the availability of breakout rooms. The ratings of the course are comparable to those recorded for the IPA online training course.[23] The primary difference between the two courses is the self-paced learning approach of the IPA course. However, the IPA course lacked the classroom feeling that the AEFI online had.

Conclusion

The PAN AEFI online course successfully achieved its overall objective of building the participants' capacity. We recommend this modality as a cost-effective and user-acceptable means of rapidly building capacity in the health workforce.

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Acknowledgement: The authors acknowledge Mr Joel Njoku and Mr Munzali for their IT support during the course.

Authors' Contributions: SAE conceived the study, developed the course curriculum and assessment tools, facilitated the course, and analysed and interpreted the data. SAE also wrote the draft of the manuscript.

AMB, UAC, OAA, YMS, and JAO contributed to the conception and design of the course, facilitated the course, contributed materials for developing assessment tools, and interpreted the data.

OLC, YPT and YSC contributed to the concept and design of the course and participated in the interpretation of data.

EE, FZL, IHU, KH, AA, GMA, OOG, TP, TY contributed to the conception of the course and interpretation of the data. All the authors approved the final version of the manuscript.

Conflict of interest: The authors declared no conflict of interest.

Funding: This project was funded by a grant from the American Academy of Paediatrics.

Accepted for publication: 28th June 2025.

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