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Strengthening the capacity of midwives in humanitarian and fragile settings using the safe delivery+ programme: Lessons from implementation in Jordan

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Abstract
This study evaluates the implementation of Safe Delivery+ Programme in refugee camps in Jordan, which integrates the Safe Delivery App, to strengthen the capacity of healthcare professionals. 41 midwives and sexual and reproductive health professionals were trained in key clinical areas including Active Management of the Third Stage of Labour, Neonatal Resuscitation, and Postpartum Haemorrhage, using adult learning principles. A mixed-methods evaluation assessed changes in knowledge and the acceptability, relevance of the training. Among 31 participants who completed both baseline and endline assessments, there was a 15 percent increase in clinical knowledge. Participants reported that the Safe Delivery App supported training was useful for quick reference and improved their ability to provide quality care. Scaling up the Safe Delivery App offers a promising opportunity to improve maternal and neonatal outcomes across Jordan and similar fragile settings.

Keywords: Humanitarian, Jordan, maternal care, mHealth, Midwives

1. Introduction
In humanitarian and fragile settings, maternal and neonatal health outcomes are often poor and not on track to meet global, regional or national health targets [1]. Pregnant women and girls lack access to functional health facilities and adequately trained midwives [2]. Research conducted by The BRANCH consortium across various geographic and conflict settings finds a wide gap in the implementation of newborn, sexual and reproductive health services, such as abortion and post-abortion care, contraceptive care and maternal care services for stillbirths [2].

The WHO standard for providing quality care for women and newborns requires a competent and motivated workforce working within an enabling environment [3]. UNFPA aligns closely with the WHO standards for providing quality care for women and newborns, emphasising a competent and motivated workforce within an enabling environment [4].

Nove et al. reported in their study the critical role played by midwives in achieving the essential quality of care for mothers, newborns, and child and adolescent healthcare [5]. Midwives provide maternity services as well as other preventive health and treatment services. These include the promotion of breastfeeding; immunisation; immediate newborn care; comprehensive abortion care and post-abortion care; contraceptive counselling; screening and treatment of postnatal depression [3]. A global shortage of 900,000 midwives is a significant barrier to the provision of quality sexual, reproductive, maternal, newborn, child and adolescent health services [6]. This is especially the case in humanitarian settings where midwives, who are mostly women, may be deterred from working in these environments due to security concerns [1,2].

The major barriers identified in implementing maternal and neonatal health care in humanitarian settings include a weakened health workforce, inefficient delivery of health services, lack of leadership, governance and coordination, lack of essential medical supplies [7]. Krause et al.'s study of reproductive health services in Za'atari Refugee Camp in Jordan revealed that Syrian refugee women living in the camp had low utilisation of facility-assisted

birth [8]. This was attributed to the lack of respect women received from camp health providers. Even though the UN provided free maternal and reproductive health services, many women in Za'atari were reluctant to use them due to poor quality and lack of privacy. In addition, women described the facilities as being attended by unqualified professionals and lacking basic resources [8].

Another challenge that is observed is the frequent turnover of the staff and the loss of experienced and trained personnel at different levels contributes to poor quality of care. This also puts an additional burden on resources and funds for the capacity development of the new staff [8]. The use of mHealth tools for capacity building of healthcare professionals is globally accepted [9, 10]. Maternity Foundation along with partners UNFPA Jordan and Jordanian Health Aid Society international (JHASi) identified the blended training package along with the micro-learning approach used by the Safe Delivery App (SDA) as a solution.

The primary objective of the Programme was to enhance the quality of care provided by midwives and sexual reproductive healthcare (SRH) professionals through access to up-to-date evidence-based clinical guidelines, and descriptions of practices for routine and emergency care by using competency-based learning and training.

A core component of the programme is the Safe Delivery App (SDA). The Safe Delivery App (SDA), developed by Maternity Foundation with the Universities of Copenhagen and Southern Denmark, was initially designed to guide midwives and SRH professionals in managing obstetric and neonatal emergencies. It has since expanded to include preventive and promotive maternal, neonatal, and reproductive health content [11].

The SDA provides evidence-based, clinical guidelines directly on a mobile phone or tablet. The SDA is available for free on Google Play Store and Apple App Store and works offline once downloaded [11]. A randomised control trial conducted in Ethiopia showed a significant improvement in the skills and knowledge of midwives who used the SDA for perinatal care compared with a control group that followed regular training models [12]. Subsequently, other studies have also found an increase in knowledge of the management of postpartum haemorrhage and neonatal resuscitation in all those who used the mobile application [13,14].

At present, the SDA includes 20 modules focused on evidence-based key interventions for women and newborns around the time of birth (Basic Emergency Obstetric and Neonatal Care (BEmONC)) and preventative procedures aligned with global or national clinical guidelines [11]. It is available in five global languages based on WHO guidelines (English, French, Arabic, Spanish and Portuguese). Of the 20 modules available, the global English version has 17 modules, and the global Arabic version has 15 modules [11].

To use the SDA effectively, healthcare professionals need to be familiar with its features. Therefore, before training on essential midwifery skills, simulation training is initiated to train on the use of the SDA, to help them navigate and utilise the to its full potential.

This paper evaluates the effect of implementing the Safe Delivery+ Programme, which couples the SDA with training sessions to strengthen the capacity of midwives and SRH professionals in a humanitarian and fragile setting.

2. Materials and Methods

2.1 Study design

The project evaluates and explores the midwives and SRH professionals' experience, perception and acceptability of using the SDA in the Za'atari camp in Mafraq along with in-person training sessions. The evaluation was conducted using a multi-phase mixed-methods approach. Data were collected at two time points using the convergent parallel approach [15]. Quantitative data was collected using knowledge assessments before the training and 3 months after the training. This was to evaluate the change in knowledge levels due to the intervention (training and usage of SDA). Following this, in the fourth month after the training was provided, qualitative data were collected through focus group discussions with a purposive sample of participants to understand their experience of the training and use of SDA. The findings from both data types were compared to draw comprehensive conclusions.

2.2 Study setting and participants

The training, part of the Safe Delivery+ Programme, was held over three weeks for 41 healthcare professionals at the Za'atari camp, including general practitioners, obstetricians, gynaecologists, paediatricians, midwives, and nurses. Jordan Health Aid Society international (JHASi), the national implementing partner of UNFPA Jordan, organised the training. A purposive sample of participants was selected by the implementing partner, that is, all the healthcare professionals working in the refugee camps had to undergo the training as part of their capacity-building activity organised by JHASi. The training focused on emergency clinical topics such as Active Management of the Third Stage of Labour (AMTSL), Neonatal Resuscitation (NR), and Postpartum Haemorrhage (PPH). Over three weeks, the healthcare professionals were divided into three distinct groups, each undergoing three days of training provided by trainers trained by Maternity Foundation. The training included an introduction to the SDA and a combination of theory and practical sessions on the three clinical topics. Adult learning principles were followed and the trainees were taken through different exercises to unlearn certain traditional practices and enhance learning of evidence-based practices. Skill stations to demonstrate critical skills such as 'compression methods for PPH management' were arranged and the trainees were trained on them.

2.3 Data collection and analysis

To assess the effectiveness of the training provided by the trainers and the utilisation of the SDA, a pre-training knowledge assessment was conducted before the training session. The assessments covered a variety of clinical topics included in the modules of the SDA and were held in English and Arabic. The data collection forms were developed in the Kobo data collection tool. Descriptive analysis was used to assess the change in knowledge levels among the participants. Microsoft Excel was used for the data analysis.

In addition to the knowledge assessment survey, participants were invited to engage in a discussion session to capture their feedback and experiences related to the training and use of the SDA. Four focus group discussions were conducted with 32 participants in the health facilities. The participants were selected on the basis of their participation in the training sessions and availability. The focus group

discussion guide was developed in English. The discussions were conducted by researchers in UNFPA and were recorded using recording devices. Transcriptions were done following the true verbatim method to accurately capture experiences. Data was analysed using 'Thematic Analysis' [16]. This involved listening to the audio and reviewing transcripts, identifying key themes, assigning codes to the relevant data, structuring codes and sub-codes into thematic categories and drawing conclusions from the findings. A concept map was developed using the software NVivo (Version 14, Lumivero).

Furthermore, to understand overall SDA usage during the project period (October to December 2023), data was extracted from the Maternity Foundation's SDA dashboard. The dashboard provided aggregated, anonymised data on app downloads, user profiles, and engagement with specific features and modules. No identifiable information was collected or shared. This usage data offered contextual insights into how healthcare professionals interacted with the app following training.

2.4 Ethical considerations

The project was initially designed as a capacity-building initiative, and data were collected as part of routine project evaluation rather than for generalisable research. As such, ethical approval was not sought at the outset, in line with organisational guidelines. However, upon recognising the broader relevance of the findings, the team pursued publication to share insights more widely. Standard ethical procedures were followed throughout, including informed consent, anonymisation of data, and minimisation of participant risk. A Monitoring and Evaluation protocol outlining consent and data management procedures was developed, shared with stakeholders, and approved before implementation.

3. Results

3.1 Sample characteristics

Of the 41 midwives and SRH professionals who received training as part of the programme, 31 completed both the pre- and post-assessment surveys, and their responses were considered for analysis (N=31). The final response rate achieved was 75.60%.

Most of these participants were midwives (48.38%), followed by clinical nurses (22.58%). 45.16% of participants had more than 10 years of experience, with the rest having between 2 and 10 years of experience (Table 1).

Table 1: Demographic characteristics of the participants (N=31)

Characteristic	Number (%)
Profession	
Midwife	15 (48.38)
Nurse	7 (22.58)
Physician	5 (16.12)
Obstetrician	2 (6.45)
Others	2 (6.45)
Education	
Bachelors	12 (38.70)
Diploma	15 (48.38)
Masters	4 (12.90)
Years of experience	
Less than 1 year	1 (3.22)
1-2 years	1 (3.22)
2-5 years	8 (25.80)
5-10 years	7 (22.58)
More than 10 years	14 (45.16)
Access to the internet at home or clinic	
Yes	29 (93.54)
No	2 (6.45)

3.2 Knowledge assessment

The knowledge assessment consisted of 31 questions covering various clinical topics discussed in the training or included in the SDA.

Before the training and using the SDA, participants, on average, answered 51% of the clinical questions correctly. After the training and use of the SDA, participants answered an average of 66% of the clinical questions correctly, resulting in a 15-percentage point increase. This improvement indicates the effectiveness of the programme and underscores the value of the SDA in enhancing participants' knowledge of clinical topics (Figure 1).

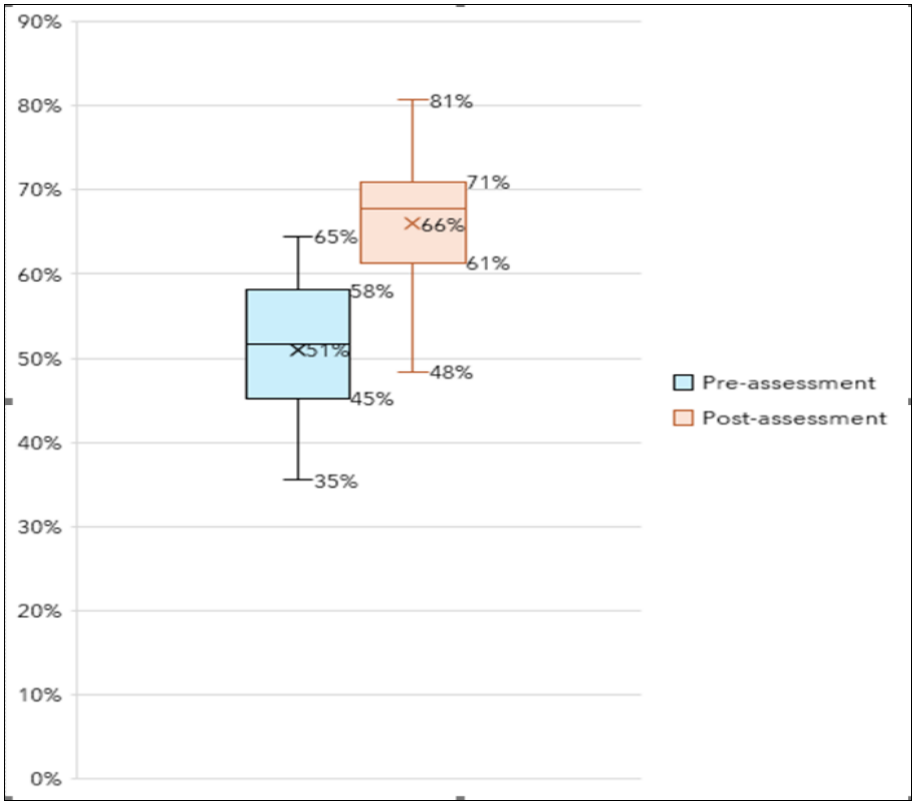

Fig 1: Pre-and post-knowledge assessments

Focusing on each clinical topic, there were improvements in scores for other critical topics, including hypertension, manual removal of the placenta, maternal sepsis, newborn management, post-abortion care, and prolonged labour. However, certain topics such as infection prevention witnessed a 2% decline, and low birth weight experienced a 7% decline in scores when the post-assessment was conducted (Figure 2).

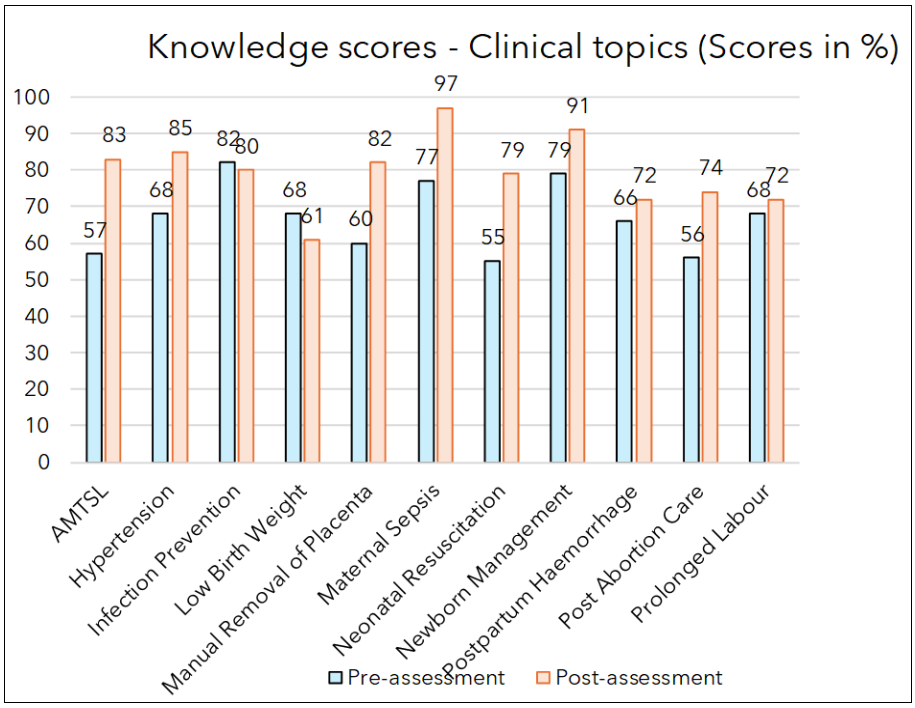

Fig 2: Knowledge scores - Clinical topics (Scores in %)

3.3 Focus groups Discussion

Four focus groups were conducted with a total of 32 participants. The distribution of the sample and their profession distribution is shown in Table 2.

Table 2: Focus group sample size as per profession (N)

	Focus Group 1	Focus Group 2	Focus Group 3	Focus Group 4
Midwives	5	4	3	4
Nurses	2	2	3	-
Doctors	1	2	1	1
Supervisors	1	1	-	2
Total	9	9	7	7

Figure 3 depicts the three major themes and eight major sub-themes that emerged from the discussions.

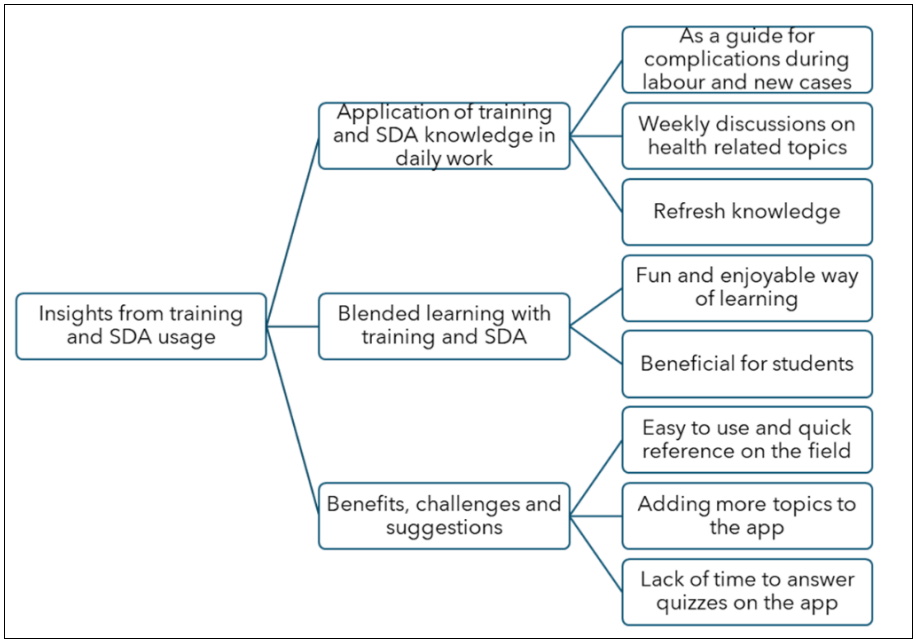

Fig 1: Illustration of themes and sub-themes describing insights from training and SDA usage

Theme 1: Application of training and SDA knowledge in daily work

The participants described the SDA as a valuable resource for quick access to crucial information, to support sound decision-making, and to facilitate the refreshment of knowledge, particularly in dealing with infrequent cases. The participants also found certain topics such as mental health and family planning useful to learn as this knowledge equipped them to provide better care to mothers.

"As a midwife, according to the medications sometimes I feel confused about the dosage and the appropriate drug, instead of search using google, I find the solution in the app in a quick way and from the guidelines." Midwife

"As a gynaecologist, I learned new concepts to assess patient status, I learned how to save a baby's life if the paediatrician is late or the nurse is non-qualified, I love how the app discusses this concept in detail and clear steps." Doctor.

The participants along with their clinical supervisor have established weekly learning sessions that involve selecting topics from SDA for discussion and review. These learning sessions have also been instrumental in improving participants' daily work.

"Weekly learning session with the clinic supervisor and the staff, they choose a topic from the App to discuss it and review them. The discussions show a better outcome, and great results reflect on their work." Supervisor

The training along with the SDA increased knowledge and confidence to handle more complex cases in a fragile setting such as a refugee camp.

"I faced a case with a premature baby 27 weeks, I have the confidence and the knowledge and am ready to treat this case and save his life because I learned how to treat and deal with those cases from the App." Midwife

"The App makes me confident that we are working at a high level in the camp." Midwife

Theme 2: Blended learning with training and SDA

Participants appreciated the innovative and interactive learning methods, practical content, and engaging presentations, which deviated from traditional training programmes. The flexibility of using a mobile app on their personal phones added a dynamic dimension to their learning. The training's structured approach, with updates and feedback after 3 months, inspired continuous knowledge application.

Participants reported that the inclusion of different activities and interactions, in addition to theoretical learning, fostered a fun and clear learning atmosphere. Beyond knowledge, the training provided opportunities for participants from different shifts to connect, enhancing teamwork. Participants found the training highly suitable for their individual learning needs, encompassing various aspects including group discussions and quizzes.

"Usually, any training we take ends in the moment. However, the idea of having updates and a follow-up for training in stages, with feedback after 3 months, encouraged me to continue using the application. The training is enjoyable and different, the training content is practical, and the way it's presented is fun and flexible. I also had a meeting with the other team members who are following the training." Midwife

"The concept of encouraging the use of the app after 3 months surprised me because I used to think that training is usually boring, but it was very enjoyable, the app is easy to use, has unforgettable information and there are motivating games for further training." Nurse

Theme 3: Benefits, challenges and suggestions

The midwives and SRH professionals had always expressed a need for some form of continuous learning modalities and SDA was the solution which was easily accessible through their phones.

"A great decision is actually to implement the app, particularly in a camp, in a setting where this is much needed, and most relevant." Supervisor

Participants found the SDA to be user-friendly and easily accessible. Some participants specifically noted the usefulness of the Arabic version and praised the well-organised topics and design. The app's features, such as concise videos, engaging quizzes, and summarized texts, were particularly commendable for enhancing the learning experience.

"The App is easy to use and complex. It's useful for primary health care. It is easy to access." Midwife

"Each topic has lectures and videos so I can watch the video if I don't want to read." Midwife

"Good for us because we don't like books as references and we prefer apps and phones." Midwife

Participants also identified various challenges and concerns related to the SDA, such as uncertainty about how updates of the SDA were managed and weak search options within the SDA (not word sensitive). The participants also reported not using the quizzes due to lack of time and fear of failing the tests.

"The search is weak, if you don't know how to search and what to write exactly you will not find the topic you want easily." Doctor

"I agree with her, I don't want to assess my learning, I just want to know information in such a situation." Midwife

"Fear of failure, if I fail, I will not apply for the exam again." Midwife

Participants made specific recommendations for improvement:

- **Inclusion of additional topics:** Shoulder dystocia, diabetes mellitus, ruptured uterus, abortion.
- Addition of more information related to pharmacy, including the way of giving and dosage of medications.
- Recommendations for using social media platforms like WhatsApp to share the SDA with more healthcare professionals in Jordan.
- Inclusion of reference links within topics to facilitate deeper understanding and further exploring of specific subjects.

3.4 SDA usage overview

From April 2023 to March 2024, 79 healthcare professionals downloaded the SDA in Jordan. Of these, 50% were midwives, while the rest were nurses, physicians, and students in sexual and reproductive health education. Almost half (46%) of the healthcare professionals worked in primary healthcare facilities, with the remainder in colleges/universities or secondary healthcare facilities. The most used feature of the SDA was the Action Cards. Despite the training's emphasis on using the quizzes to test knowledge, the MyLearning feature was utilised by only 17 users. The module most visited by users was Post-Partum Haemorrhage, which is also the number one cause of maternal mortality in Jordan [17].

Discussion

The study evaluated whether training and an mHealth tool could help midwives and SRH professionals provide quality care in humanitarian and fragile settings. The findings suggest that healthcare professionals benefitted from the combination of the training and the use of the SDA. There was an increase in the knowledge levels among the participants. This is in line with similar evaluation studies combining the use of the SDA and training conducted in Ethiopia, Rwanda and India [14,18,19]. However, the baseline knowledge levels were lower than those of similar studies. This indicates a need for more training and continued usage of SDA. SDA is positioned to act as a micro-learning and training tool for the retention of knowledge and skills over a longer period, as demonstrated by a study conducted in Ethiopia to assess SDA [14].

Midwives and SRH professionals found value in utilising the SDA's offline feature, enabling them to access information and search for specific topics as required. In rural regions, the application served as the primary resource for midwives to review information concerning safe deliveries. The midwives are on their own in camps and this tool was reported to be a trusted source of information, acting both as a job aid and a reference tool. Studies conducted in the Democratic Republic of Congo and Rwanda support the finding that the SDA is an empowering and user-friendly technology [13,18].

Additionally, there is a turnover of staff and there is a need to constantly train the staff [8]. This tool could be a solution to overcome the challenge of retraining staff. The facilitators suggested that yearly training, along with training in other camps and organisations, could address this issue. The final thoughts, however, were that the SDA would be useful for the midwives, and they would like to make it mandatory for everyone in the organisation to ensure continuous learning.

The SDA was also utilised by midwives and healthcare professionals for weekly discussions on topics that facilitated peer knowledge sharing. This innovative use of the SDA fosters discussions and support aimed at enhancing day-to-day professional knowledge. Notably, no prior studies on the SDA have documented its use in this manner within the daily practices of midwives.

The successful adoption of the blended training and the app can be attributed to strong partners in the context who supported in implementation by guiding the local context throughout the project implementation. Studies on implementation in fragile settings emphasise the importance of coordination mechanisms between organisations [20,21].

The success of any mHealth app is dependent on cascading the information to as many beneficiaries to ensure its effectiveness. Integration of the SDA into Continuous Professional Development will be beneficial in ensuring the scale of the App and continued usage. India where the Indian version of the SDA was launched in 2017 is an example of how the partnership with government bodies and partners within the country can play a pivotal role in the national adaptation and integration of SDA into a country [22].

Integrating the SDA into midwifery curricula offers the

benefit of equipping future midwives with the necessary updated theory and practical knowledge. This integration will ensure that midwives are proficient in using the SDA as a job aid, especially in low-resource settings.

Finally, this study has limitations. The study findings cannot be generalised due to the small sample size. The change in knowledge could not be tested with statistical methods due to the lack of power in the sample size. The study does not assess the long-term impact of the training and SDA usage among the participants. However, the positive reception and the perceived usefulness of SDA by the midwives and SRH professionals will create an opportunity to cascade the benefits of the app to other professionals. The findings of the focus group discussions provide context and reasons behind the participants' responses. Despite the challenges of implementing a project in a refugee camp setting, the support from implementing partners was crucial in effectively assessing the benefits of the programme and SDA. The overall study findings provide an opportunity to further explore changes in maternal and neonatal health outcomes during the scale-up of SDA in the country and region.

Conclusion

This study's findings are significant in supporting the further development of strategies for the adoption of the Safe Delivery+ Programme along with the increased uptake of the SDA in the region. The healthcare professionals who were part of the training and used the SDA were satisfied with the programme's role in increasing knowledge in managing the mother and newborn's health. It has been demonstrated to be a useful job-aid in low-resource settings such as a refugee camp. These findings will add to the evidence that mHealth applications such as the SDA can act as a job aid, micro-learning and capacity-building tool for midwives and SRH professionals in humanitarian and crisis-affected regions. The study paves the way for broader dissemination of findings and the effect that the programme can have in crisis environments.

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Abbreviations

Safe Delivery App: SDA AMTSL: Active Management of the Third Stage of Labour; BEmONC: Basic Emergency Obstetric and Newborn Care; FGD: Focus Group Discussion; JHASi: Jordan Health Aid Society international mHealth: mobile health; mLearning: mobile learning; LMICs: Low- and middle-income countries; NR: Neonatal Resuscitation; PPH: Post-Partum Haemorrhage; SRH: Sexual and Reproductive Health; UNICEF: United Nations International Children's Emergency Fund; UNFPA: United Nations Population Fund; WHO: World Health Organization.

Conflict of Interest: No conflict of interest

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