Children Immunization App (CImA), Low-Cost Digital Solution for Supporting Syrian Refugees in Zaatari Camp in Jordan – General Description

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Abstract. Mobile applications (apps) can improve health outcomes. In this study, we have described an app developed for documenting the history of vaccination among Syrian children in one of the largest refugees' camps in the Middle East region. This app includes health education information and automated reminders for parents, using a visual tool for parents with low literacy level. We have emphasized on the usability and technical concerns and have described the interdependency of technical and human considerations for such health app solution in a marginalized context.

Keywords. refugees, vaccination, Jordan, technical literacy education, mHealth

1. Introduction and Methods

Since the onset of the Syrian crisis in 2011, the Syrian refugees are considered as a mobile population due to their migration to the Middle East and Europe. The need for vaccination of children among such refugees is crucial as they may be exposed to crowded locations or low vaccinated areas [1,2]. Thus, spreading awareness about the health benefits of vaccination, using automated reminders, and reducing the risk of losing their vaccination documents became a high priority. Smartphone ownership, Android in particular, among refugees is considered high. The Children Immunization App (CImA) is a new mobile phone app designed to i) provide access to trustworthy, evidence-based vaccine information; and ii) record vaccination history for children according to the Jordanian national vaccination guidelines. The app is available in Google Playstore, and in this study, we describe the creation and to-date utilization of CImA app. The CImA-Jordan app is available in English and Arabic (The content is available in an interchangeable fashion and it is dynamic, i.e. the user can enter the vaccination history in Arabic and then it can be read in English automatically).

A) App development: According to our knowledge there is no tailed-made vaccination app developed to meet the needs of refugees. This includes health education,

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recording vaccine history and reminders. Also we have developed the app in collaboration with UNICEF and the Ministry of Health of Jordan, so it meets the local needs of the target population. The CImA app [3] was launched in Zaatari camp in March 2019, as a part of a trial to test the impact of the app on vaccine uptake for newborns, aged 0-4 months [4]. The app includes: i) ***Welcoming two short messages about the overall benefits of vaccination***, developed by UNICEF in Arabic. The UNICEF has developed and tested simple health education messages about the benefits of vaccination in protecting children and the general community. They have tailed these messages using graphs and short take-home messages in the form of small-sized posters that are shown at the refugees' camp. Picture 1 states the message "We are protected together: Vaccines works on the same aim of being all protected," and the content of poster 2 includes: "We include our children, we protect our countries. We appreciate your commitment to the vaccination schedule according to the national Jordanian guidelines." ii) ***Vaccine-related information about the benefits of each vaccine:*** We have developed specific information about the benefits of each vaccine in a simplified way. Also, we have adapted the health belief model where we have shared specific messages on the risks of each disease and the benefit of its respective vaccine [5,6]. iii) ***Personalized vaccine accounts creator for each child in the family:*** At the time of app installation, the parents will create an account in the app where both parents can write their names. Then the parents can add each child into the app, including the date of birth, gender, and vaccine history for each child. All vaccines were added according to the Jordanian national vaccination guidelines. We have adapted the "traffic light" analogy using red, orange and green labels for missed, due, and completed vaccination visits, respectively. This idea was adapted from the so-called brain reward system where traffic light colors were connected with a reward system that was proven helpful in affecting people behavior in another public health field [7] (Figure 1).

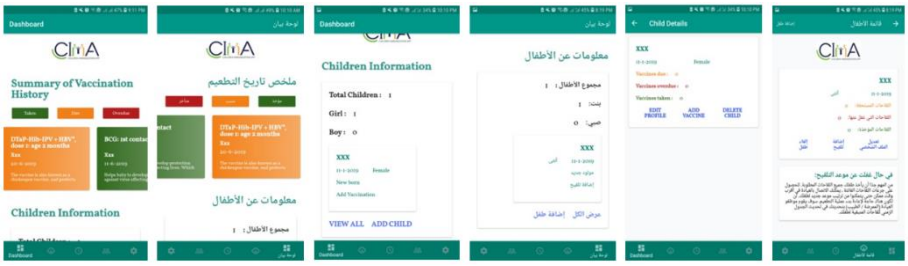

Figure 1. An example of vaccine description for parents

B) App Testing: The CImA study team includes the nurses and fieldworkers at the Zaatari camp to initiate the study, as described in details previously [4]. Prior to the official launching of the study, the team members tested the app and provided technical feedback to the technical vendor to make the requested updates. Then the final version of the app was submitted to the Google Playstore, thus, making the CImA app available to the public. However, we have included a PIN code to limit the app for the intervention group during the study. We plan to make the app fully accessible to public after the completion of the study [4].

We worked with local partners in the camp, including governmental and non-governmental organizations that manage the camp and local healthcare facilities. We have briefed and trained the representatives of these organizations about the app. We have prepared a print-out about the content of the app in the vaccination sites and shared the guidelines on using the app with the parents.

Additionally, the camp has approximately 70 community workers who focus on imparting health education to the refugees. They were active in advocating for the app in the community. We have collected data on households locations and connected it to the longitude and latitude data of the camp shapefiles [8] using Stata/MP 14.0 [9].

App functionality: Technology Stack was designed for Android. The design tools/software included Android Studio 3.4. The app language was Kotlin. The Operating System (OS) included Android 4.0 and above. The Database (local) was SQLite. Regarding web-interface, the web development language/framework was Laravel 5.5, and MySQL was used for web development (website/backend). For maintaining security on the web, the following three measurements were implemented: i) Secure API request, ii) Encrypt API request, and iii) Store encrypted user information and vaccine data in database. The app features include the following: 1) Languages support for English and Arabic; 2) Account setup: it allows creating a new account using the CIMA study id number; 3) Add child account: the user can add multiple children into the app; 4) Manage child data: the user can Edit/Delete child; 5) Add vaccine: i) the user can add multiple vaccines child-wise; ii) the user can add a vaccine from a customized list according to the Jordan-MOH vaccination schedule; 6) Reminder Vaccine: the app sends a reminder for vaccine in the form of a message on the Android screen; and 7) Offline support: the app can work without internet (i.e., offline) and allows users to add child and vaccines in offline mode.

Ethics: The CImA study was reviewed and approved by the Institutional Review Board of the Jordan University of Science and Technology (JUST) (Reference # 14/112/2017, date 14/1/2018). Also, the project proposal was reviewed and approved by the Ministry of Health in Jordan (Reference # MOH-179; 16-02-2017). The data were collected using a secured online portal and stored in a secure and encrypted server. Finally, only the research team had access to the data.

2. Results

Since 5 March 2019, the piloting of the app has started at the Zaatari refugees camp. We have used train-the-trainer method for the Jordanian Ministry of Health (MOH) staff. This modality was instrumental in the internal training at the camp because the MOH staff work daily at the camp and the vaccination work is aligned with their work mandate at the camp (Figure 2).

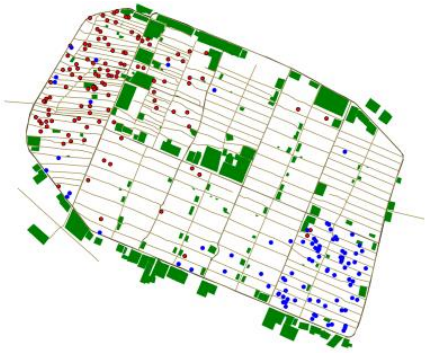

Figure 2. Overview of the location of study participants in the camp (Red circle: Intervention; Blue circle: Usual care/comparison)

3. Conclusion

The CImA app showed promising results in supporting the parents to keep track of their children's vaccination records. The data results will be finalized shortly after the official ending of the study.

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