Strengthening Responsive Feeding Practices: A Mobile Health Application for the Responsive Feeding Practices Assessment Tool (mRFPAT)

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Abstract

Background: Caregivers play a crucial part in early childhood development. Responsive feeding is an essential aspect of nutrition promotion in early childhood. It has been proven that responsive feeding fosters a strong attachment with the child and enhances their health and development. According to the literature, this feeding method is not highly focused in low- and middle-income countries. An assessment tool for responsive feeding practices focusing on infants has been developed and validated in Sri Lanka.

Objective: This paper aims to discuss the developed mobile health application (mRFPAT) for the currently published responsive feeding practices assessment tool in Sri Lanka.

Methods: The hybrid mobile application development platform served as the foundation for creating this mHealth application, and it supports Android and IOS operating systems. NoSQL was used to build the database and implement it using the cloud. The application back end was designed using the java programming language. The mRFPAT can be downloaded through the given link: https://www.mediafire.com/file/z5qib8t4thd4k8v/RFPAT_app_v1.2.1.apk/file
The app downloading process and procedures for app use can be viewed at, https://www.youtube.com/watch?v=OrOaKHuDGNQ

Results: This app has three stages: proactive preparation of the feeding context, attentiveness to the child's signals and appropriate feeding, and responsive communication. At the end of the questions, the app users are directed to a blog of various helpful resources on responsive feeding, and caregivers can change their infant's feeding behavior based on the given backing information.

Conclusions: In conclusion, a mobile version of the responsive feeding assessment tool was introduced to promote nutrition among infants and young children. Interventions can be planned to promote the health and development of infants and young children using the developed mobile app. However, it is better to verify the effectiveness of this mRFPAT for improving nutrition among children as an innovative intervention.

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Keywords: Child Development; eHealth; mHealth; Nutrition; Responsive Feeding

Introduction

Electronic Health (eHealth) refers to information and communications technologies, including medical informatics, public health, and business data in healthcare. Its efficiency, quality, flexibility, and user-friendliness are vital features of being popular among users. Mobile applications are the newest trend in assessing health behavior changes, and they aim to empower people to access information quickly. Research on mobile health (mHealth) is a growing arena in eHealth globally. World Health Organization has identified eHealth services as cost-effective and has taken initiatives to increase eHealth approaches [1]. A recent mHealth research analysis has illustrated that mHealth apps play an immense role in health care. A recent systematic review has demonstrated the higher effectiveness of mobile health applications for changes in health-related behaviors and clinical health outcomes [2].

Because of its long-term impact on the lifespan, early childhood development (ECD) is one of the most critical concerns. The sustainable development goals have mentioned achieving the fullest potential of early childhood development in different aspects (i.e., education, health, nutrition, and protection). As a result, different global-level organizations have undertaken various projects to improve early childhood development globally. In other words, early childhood development can be identified as a foundational arena in sustainable development goals, and global-level commitments to promote early childhood development are growing because it has been recognized as a beneficial investment [3]. The ECD definition has three sections: a) the early childhood period is considered from conception up to eight years, b) development is considered an outcome and focuses on a few general domains, including cognition, language, motor, and social and emotional development, and c) development results from an interaction between the environment and the child [4]. According to the Lancet 2010, over 43% of children under five suffer from risky situations in achieving their development goals worldwide [5]. Social determinants of health play a central role in developing these health and well-being inequalities in early childhood while primarily responsible for health inequities, which are the systematic differences in health outcomes or differences in health resources [6]. Creating a supportive environment for the development of children is highlighted in the global agenda called "nurturing care" concept of early childhood growth and development [5]. It consists of five domains, and nutrition and responsive caregiving are two crucial domains.

Parents play a crucial role in early childhood development and nutrition promotion through

positive caregiving. There are four types of parenting styles, and these can be divided into two main categories: responsive (permissive and authoritative) and non-responsive (uninvolved and authoritarian). Based on the demand, the authoritative style consisted of the most responsive parenting features. Responsive parenting has been recognized as a high quality of attachment with the child that aggrandizes holistic development [7]. Healthy feeding is one of the critical features for health and development, and it is determined by not only the quality and quantity of the foods but also the favorable feeding environment. Recent studies have shown that parent-child interaction during the feeding context plays a key role in positive child outcomes [8].

Responsive feeding (RF) can be described as the reciprocity between the child and the caregiver while feeding, and the concept has been conceptualized as four steps process: a) the creation of a structured routine, whereby expectations are made known, and emotions promote interaction, b) the signaling of cues by the child through motor actions, facial expressions or vocalization, c) the prompt response of the caregiver to these signals in a manner that is supportive, contingent and appropriate, and d) the perception of the response by the child in a predictable manner [9]. Non-responsive feeding directs to the development of overnutrition and undernutrition among children. There are three types of non-responsive feeding styles, and those are associated with negative parenting styles: a) indulgence type, where the child controls the feeding situation; b) uninvolved type, where the caregiver ignores the child during meals; and c) pressuring and controlling (restricting) type, where the caregiver takes excessive control [7]. The various aspects of the RF have been studied by scholars during the last few decades, specifically targeting both developed and low- and middle-income countries. However, we could identify a limited number of studies in RF worldwide, and the RF discipline is still developing. Bentley et al. have shown the evolution of RF research and the positive association between RF and undernutrition among children in low- and middle-income countries [10]. Hurley et al. have highlighted that non-responsive feeding is highly associated with overweight and obesity among children in high-income countries [11]. Studies have demonstrated that RF can contribute to optimal growth and psycho-emotional, social, and cognitive development as one of the fundamental areas of nurturing care [12, 13].

In the Sri Lankan context, the national eHealth guidelines and standards are introduced to streamline the implementation of eHealth solutions in the health sector [14]. Currently, mHealth applications are applied to track and monitor health and nutrition status among children and pregnant women in Sri Lanka [15]. In observing a child's healthy growth, efforts

to reduce malnutrition are essential. RF has proven that a healthy child results from good health habits that its caregivers mainly adopt. RF is favorable to building the foundations for a healthy life, and it is a two-way feeding relationship that must be made between a mother and her baby. RF is not extensively known at the grassroots level of health care, and it is a neglected concept in the infant and young child feeding programs in most low and middle-income countries. Based on this background, a mobile version of the responsive feeding assessment tool was developed and introduced to promote early childhood nutrition. This study aimed to develop a mHealth application for the currently published responsive feeding practices assessment tool (RFPAT) in Sri Lanka.

Methods

The RFPAT, developed in Sri Lanka, was applied to develop this mobile application. The RFPAT has been developed and validated using standard questionnaire development techniques, and the current study aimed to transform the RFPAT into a mobile application that caregivers can employ as a monitoring tool and nutrition promotion initiative among children. The mobile health application for the responsive feeding practices assessment tool (mRFPAT) includes 15 items, the same as the initial RFPAT. All questions had five responses (always, often, sometimes, rarely, and not at all) and were scored as 4, 3, 2, 1, and 0, respectively. The total scores of the assessment range from 0 to 60. The final scale has four labels based on the composite score of the items: poor (0-34), moderate (35-36), good (37-40), and very good (41-60) RF practices [16]. The response for almost all the questions is a simple hit of response, and then the user can move to the next question. The response time is instantaneous as the questions are self-explanatory. At the end of the questions, the app users are directed to a blog on RF with various supporting materials. This education blog comprised brochures, leaflets, videos, and posters related to RF.

The mRFPAT was created using a hybrid mobile application development platform and supports Android and iOS (iOS is a mobile operating system developed by Apple Inc.) operating systems. However, it currently supports only for Android systems. Responders can use the app in both Sinhala (a local language in Sri Lanka) and English. Android Studio is the leading software for this application, and Java is the primary language. NoSQL was used to build the database because it is easy to handle and implement using the cloud. The sketch toolkit was used to design the UI/UX interface [17]. The ethical clearance for the study was taken from the ethics review committee, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka (ERC/2014/060).

Results

The mRFPAT has three stages: a) proactive preparation of the feeding context, b) Attentiveness to the child's signals and appropriate feeding, and c) responsive communication. The values of the three stages are measured in levels separately, and finally, the RF practices level is assessed. The mRFPAT can be downloaded simply through the *https://www.mediafire.com/file/z5qib8t4thd4k8v/RFPAT_app_v1.2.1.apk/file*
The downloading process and app use can be viewed at *https://www.youtube.com/watch?v=OrOaKHuDGNQ*.
A QR code for downloading purpose of the app has been given (Figure 1).

Discussion

The advancement of technology benefits communities in a variety of ways. Specifically, the use of technology for public health has become more common because it is conducive to collecting, visualizing, processing, and analyzing data very fast. mHealth applications assist in reducing time for collecting data, deviation from paper-based surveys, and automatic data visualization, and mHealth tools can be applied as self-management programs/interventions. The proposed mRFPAT app is greatly concerned with assessing the parents'/caregivers' RF behaviors. The assessment is innovative because it automatically calculates the score that gives the status of the RF levels. In addition, this provides a graphical interpretation of the behavior level that would help to understand parents. Parents can identify their current RF behavior level and, based on the intervention section, can acquire more understanding about RF to change their current behaviors if they are at a poor level. RF style directs self-regulation and healthy associations with food [9, 14, 15]. Therefore, this tool will be a novel intervention that improves physical, cognitive, and socio-emotional development through nutrition-based behavioral changes.

Using the NoSQL database, tool developers could store data without any problem. Here, one database creates many segments, and many users can use the same server simultaneously. The application back end was designed using the Java programming language. Currently, Java is the base programming language that can be used easily. Anyone using the application can select the language changing button to either Sinhala (a local language in Sri Lanka) or English. The application server side is stored in the cloud base, and the NoSQL creates a load balancer for that, so whenever the user answers the provided question, it quickly stores data and provides feedback. The mRFPAT is the first attempt to introduce mHealth aspects to the

feeding arena in the Sri Lankan context. The languages of the tool will be revised by adding other local languages (e.g., Tamil). The RFPAT developed in Sri Lanka has been culturally validated in China [18]. Therefore, other languages can be added to the app in the future. Developing an information technology-based solution (data management system) for data acquisition, analysis, and visualization for RF practices as an eHealth initiative is essential.

Conclusion

This mobile application will draw data on RF from caregivers as a tool based on modern technology. As this tool makes it convenient for caregivers to self-assess their RF practices, it benefits a large community. The self-evaluation assessed through this app will help them to identify their status and the pace of RF practice, and they can change their behavior based on supportive educational information. It will assist in reaching the short and long-term impact of RF. Therefore, it can be popularized among the public and fill the gap in implementing RF in the infant and young child feeding guidelines. However, it is better to verify the effectiveness of the mRFPAT as an innovative intervention for improving nutrition before introducing it to large-scale use. On the other hand, educators will be able to improve the community awareness of RF and help them address obstacles to their feeding practices based on the mRFPAT. Based on the assessments, policymakers will be able to fill the current field gap by verifying the effectiveness of this mRFPAT, and they can suggest revisions for persisting nutrition policies. In addition, interventions might be planned to promote the health and development of infants and toddlers based on the responsive feeding process.

Declaration of Conflicting Interests

The author/s declared no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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Figure 1: QR Code for the mRFPAT