

HEALTH PROMOTION INNOVATION IN EXCLUSIVE BREASTFEEDING THROUGH ANDROID-BASED “BUNDA ASI” APPLICATION DEVELOPMENT TO IMPROVE ATTITUDES AND KNOWLEDGE

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ABSTRACT: Current health promotion in exclusive breastfeeding is still conventional by using leaflet, poster, and direct face-to-face consultation between pregnant mothers and health workers. The number of exclusive breastfeeding coverage in Kudus Regency in 2018 was 40%. This research aims to develop an android-based application as an effort to improve pregnant mother's attitudes and knowledge towards exclusive breastfeeding. The research procedures consist of: 1) Literature study and field analysis; 2) design; 3) application development; 4) expert validation; and 5) black box test. The research takes place at Puskesmas (community health center) Bae Kudus. The research instruments include: 1) questionnaires on knowledge, attitudes, and information sources of exclusive breastfeeding; 2) product validation sheets to measure application validity level; and 3) black box test sheets. The research results indicate that 1) Pregnant mother's knowledge of exclusive breastfeeding dominantly comprises 53% in low category and 30% in medium category ; 2) Breastfeeding attitudes indicate that 26.7% in significantly less positive category and 26.7% in less positive category; 3) information sources of exclusive breastfeeding are mostly from online media of 50%; 4) media expert validation obtains an average value of 3.6 with a valid category; 5) breastfeeding expert validation obtains an average value of 3.7 with a valid category; and 6) black box test by users obtains an average value of 3.7 in a feasible category. The results show that “Bunda ASI” application is feasible to be utilized to improve pregnant mothers' knowledge and attitudes towards exclusive breastfeeding.

KEYWORDS: health promotion; exclusive breastfeeding; bunda ASI application; android

I. INTRODUCTION

Exclusive breastfeeding is defined as breast milk given to infant up to 6 months of age without any addition of and/or replacement with other foods or beverages (Regulation of the Government of the Republic of Indonesia No. 33/2012 on Exclusive Breastfeeding). Breast milk is a nutrient source for infants. Nutritional composition contained in breast milk supports infant's growth and development. In addition, it contains natural antibodies that could help preventing infection and health disorders in infants. It has complete nutrients that support infant's growth, health, immunity, and development. Breastfeeding for infants is conducted, at minimum, by providing exclusive breast milk without other foods for the first six months [1,2]. Breastfeeding for infants is recommended since breast milk suffices proteins, carbohydrates, fats, vitamins, and minerals [3] needed for infant's growth and development processes[4].

Breast milk is beneficial for infant's immunity, growth, and development [5]. It is proven to enhance infant's life quality by preventing them to get infectious diseases, such as diarrhea and respiratory tract infection that are among main causes of infant's illness and death [2]. Every dip of breast milk contains more minerals and enzymes compared to formula milk; thus, it is more effective in protecting baby from various diseases [6].

The national percentage data of exclusive breastfed in 2018 falls in 65% for overall Indonesia and 64.19% for Central Java [7]. The data indicates that 35% infants are not breastfed. It implies that the government target to achieve 80% breastfeeding coverage has not yet achieved. Referring to the exclusive breastfeeding coverage data in Kudus Regency in 2015, the percentage still outstays in 29.9% [8]. In 2018, the number has risen to 40% [9]. Despite the rise, it is still far from the average breastfeeding coverage target. Puskesmas plays an important role in increasing the number of exclusive breastfeeding coverage. Kudus City has 19 Puskesmas and

Puskesmas Bae is categorized the lowest in terms of exclusive breastfeeding coverage in 2018, showing 10.2% coverage[9].

Efforts to increase the exclusive breastfeeding coverage in Puskesmas Bae through promotional activities are carried out by means of direct consultation when pregnant mothers visiting the Puskesmas for prenatal care checkup and through an extension using exclusive breastfeeding leaflets provided by the Department of Health of Kudus City for socialization in every Puskesmas. The promotion plays a significant role in the success of exclusive breastfeeding since it is capable of improving pregnant mother's knowledge. It is in line with a research [10] stating that exclusive breastfeeding promotional activities using counselling method through extension and promotional media are able to improve pregnant mothers' knowledge and attitudes towards exclusive breastfeeding. A research result [11] states that the low breastfeeding coverage is related to the low knowledge among mothers and families of the benefits of breast milk and proper breastfeeding methods.

The limited understanding of the important of breast milk for the first six months following delivery is due to lack of information and knowledge of the mothers regarding the plus value of nutrients and benefits containing in breast milk. It is in accordance with a research [12] that one of factors causing low exclusive breastfeeding is mother's insufficient knowledge of the benefits of breast milk for baby and mother. Information on exclusive breastfeeding should be provided since a mother is pronounced as pregnant. It would be behindhand to provide the information once the baby is born since it would not trigger any changes [13]. It is also closely related to the roles of health workers as an extension worker of exclusive breastfeeding that need to enhance to achieve the number of exclusive breastfeeding program coverage.

According to a study [14], numerous pregnant mothers who have prenatal care checkups are not aware of the exclusive breastfeeding. It is corresponding to a research [15] stating that limited knowledge of breast milk and breastfeeding is an obstacle in breastfeeding. Another study [16] asserts the success of exclusive breastfeeding not merely depends on how much time available but also pregnant mother's knowledge of breast milk that promotes awareness to breastfeeding. Pregnant mother's knowledge of exclusive breastfeeding influences attitudes in exclusive breastfeeding. It is related to more knowledge of the positive aspects and objects would generate positive attitudes towards certain object. Research results by [17] states that there is a relationship between pregnant mother's knowledge and attitudes in exclusive breastfeeding plan.

Current digital era known as industry 4.0 has affected some changes in several fields in life. This era indicates by easy access to information from anywhere and at any time. Technology and information development is employed by a number of health workers to promote health to the success of public health. A successful health promotion relies on media used in the activities. Proper health media must be capable of stimulating communities to search for health information and help them to understand health-related information. Information technologies used as information media include android and website with online system. Android application system is a Linux-based operational system used for mobile phone, such as smart phone and tablet (PD) [18]. According to a study [19], 72.7% pregnant mothers acquire information from social media and almost 50% have two or more online social media platform on their phones.

Based on the above analysis of problems, an innovation is required to provide information for pregnant mothers to improve their knowledge and attitudes towards exclusive breastfeeding in the era of industrial revolution 4.0. The research is expected to create an android-based application product about exclusive breastfeeding that includes a direct consultation room. The direct consultation media room between pregnant mothers would provide specific differences and characteristics in health extension. Pregnant mothers could directly ask or consult about exclusive breastfeeding. In addition, the direct consultation feature is expected to provide a separate discussion room regarding problems faced by pregnant mothers in the implementation of exclusive breastfeeding.

II. METHOD

The research was a development research by adapting research and development steps stated by Borg & Gell. The research was intended to develop an android-based health promotion application for about exclusive breastfeeding as an effort to improve pregnant mother's attitudes and knowledge. The research procedures consisted of 1) literature study and field analysis through a survey research; 2) design; 3) development of an android-based exclusive breastfeeding application; 4) expert validation; and 5) black box test. The research took place at Puskesmas Bae Kudus.

Instruments used in the research comprised: 1) questionnaire on knowledge, attitudes, and information sources of exclusive breastfeeding among pregnant mothers. Questionnaires on knowledge and attitudes used Likert Scale with 1-4 score that consisted of 16 questions and 12 questions, respectively. Instruments on information sources used multiple choice questions that consisted of 2 questions to find out information sources used by the pregnant mothers in obtaining information regarding exclusive breastfeeding; 2) product validation sheets to measure validity level of the android-based exclusive breastfeeding consultation application system in the form of assessment questionnaires. The validation instruments contained assessment aspects that were the main

assessment of the developed product. The assessment scale score for each aspect was 1-4 that ranged from (1) not feasible; (2) less feasible; (3) feasible; and (4) very feasible; and 3) Black Box test sheets as instruments to discover the developed android application’s strengths and weaknesses with assessment scale score for each aspect was 1-4that ranged from (1) not feasible; (2) less feasible; (3) feasible; and (4) very feasible.

III. RESULTS AND DISCUSSION

The research results are consecutively described as follows according to the research steps, namely (1) survey research results; (2) design, development, expert validation, and Black Box test.

SURVEY RESEARCH RESULTS

The survey research was carried out in Bae Sub-district, Kudus Regency. Sampling was conducted randomly in total 30 pregnant mothers. The research was expected to collect information on pregnant mothers’ knowledge, attitudes, and information sources of exclusive breastfeeding. Description of knowledge was generated through questionnaires to uncover the pregnant mothers’ knowledge of exclusive breastfeeding. Percentage of the pregnant mothers’ knowledge of exclusive breastfeeding is illustrated in Figure 1.

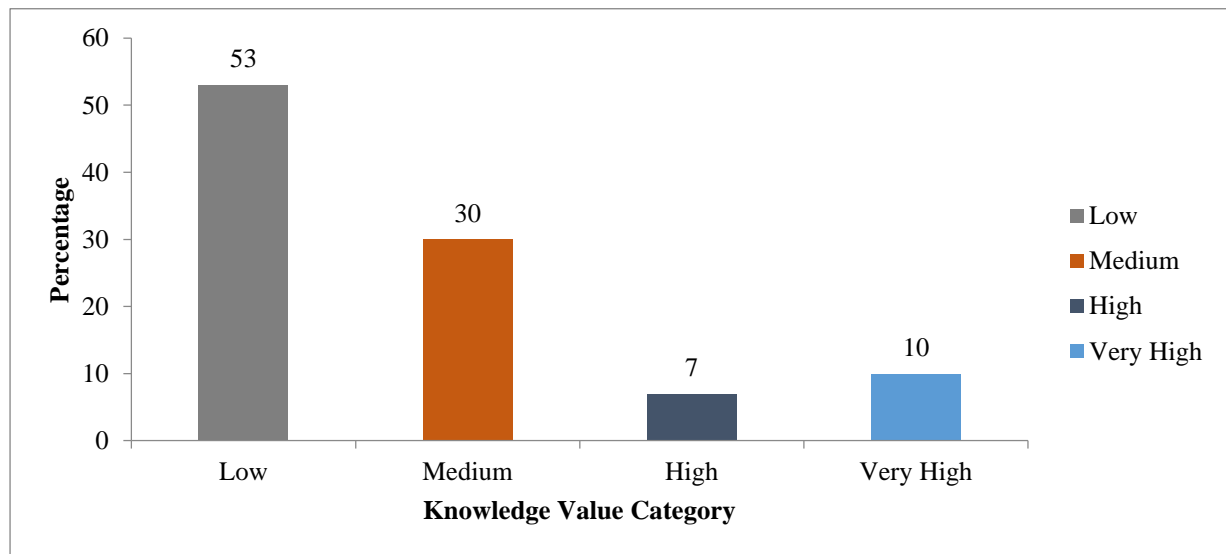


Figure 1. Percentage of Pregnant Mothers’ Knowledge

Figure 1 indicates that the highest value of pregnant mothers’ knowledge of exclusive breastfeeding was in low category of 53% and in medium category of 30%. The information suggested that an effort is required to improve pregnant mother’s knowledge of exclusive breastfeeding; therefore, pregnant mother’s knowledge of exclusive breastfeeding will no longer be in the range of low and medium categories. Knowledge is defined as an ongoing formation by someone that experiences constant reorganization with new understanding. Understanding of information acquired creates positive attitudes towards the knowledge. A research [20] states that exclusive breastfeeding relates to one’s attitudes and behaviours towards exclusive breastfeeding. Analysis result on the pregnant mothers’ attitudes towards exclusive breastfeeding according to Likert Scale questionnaires is presented in Figure 2.

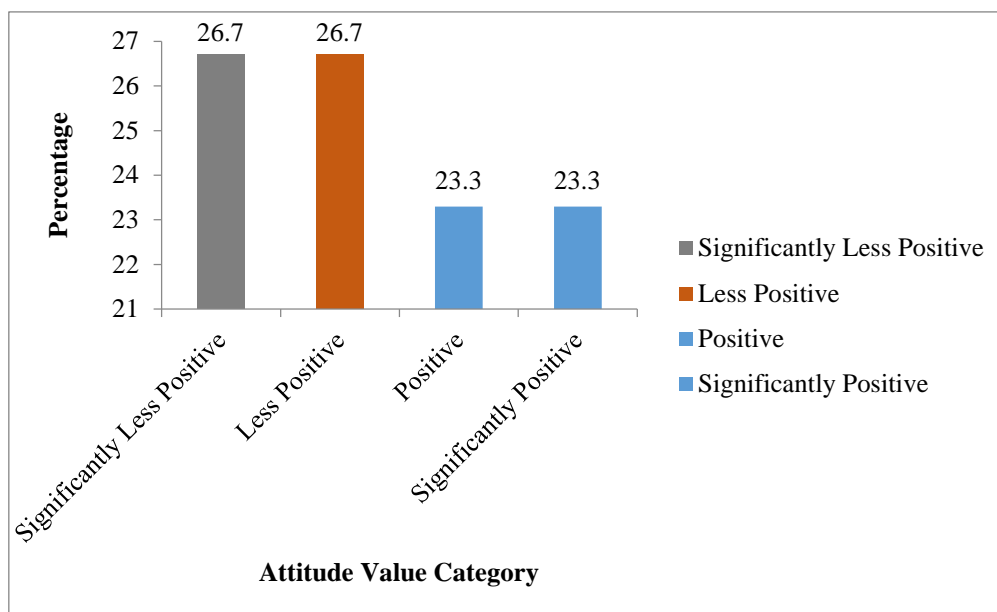


Figure 2. Percentage of Pregnant Mothers' Attitudes towards Exclusive Breastfeeding.

Based on analysis results in Figure 2, it could be seen that there were 26.7% pregnant mothers' attitudes towards exclusive breastfeeding within a significantly less positive category and 26.7% within the less positive category. Negative attitudes surely affect the success of exclusive breastfeeding implementation by the pregnant mothers. Attitudes are a requirement for action. It is a tendency of soul towards something. It indicates direction, potential, and encouragement to something [21].

The success of exclusive breastfeeding implementation was also influenced by the existence of information acquired by the pregnant mothers related to exclusive breastfeeding. Analysis results on exclusive breastfeeding information sources could be seen in Table 1.

Table 1. Pregnant Mothers' Information Sources on Exclusive Breastfeeding

No	Information Source	Percentage
1.	Text books/leaflet	13
2.	Relatives/friends	24
3.	Health extension workers	13
4.	Online media	50

Table 1 shows that the pregnant mothers' information sources on exclusive breastfeeding were mostly from online media of 50%, which was the highest, whereas the lowest was 13% from text books or leaflet and extension workers. It was supported by the questionnaire results on information sources often used by the pregnant mothers to obtain information, which was reading the online media. The detail results are presented in Table 2.

Table 2. Pregnant Mothers' often Used Information Sources

No	Information source	Percentage
1.	Text books/leaflet	16
2.	Ask people	27
3.	Read on online media	57

Table 1 and 2 provide an illustration that information source often used by the pregnant mothers to obtain information on exclusive breastfeeding was online media. Information becomes a success factor in the implementation of exclusive breastfeeding by pregnant mothers. It is in accordance with a research [22] stating that information on exclusive breastfeeding affects the success of pregnant mothers in exclusive breastfeeding. Likewise, a study [23] states that information through electronic media is the largest information type used by pregnant mothers to acquire information on exclusive breastfeeding. Use of technologies and information to improve knowledge and attitudes towards exclusive breastfeeding through android application was proven effective and had a positive effect on exclusive breastfeeding knowledge. An innovation thus requires as an educational effort to promote exclusive breastfeeding, which is using more interesting educational media via android or informational technologies.

RESULTS OF DESIGN, DEVELOPMENT, EXPERT VALIDATION, AND BLACK BOX TEST

Once the survey research analysis results obtained, it continued with designing an android-based exclusive breastfeeding application. The design was started with a step to determine component of study or content in the application. The application itself was called “Bunda ASI” application. The application design result is illustrated in Figure 3.

“BUNDA ASI”		
○ Exclusive Breastfeeding	○ Negative effects of breastfeeding using a pacifier bottle	○ Exclusive breastfeeding videos
○ Milked breast milk	○ When mothers should not breastfeed	○ Calculator
○ Tips for Pregnant and breastfeeding mothers	○ Problems in breastfeeding	○ Consultation

Figure 3. Design of Android-based Exclusive Breastfeeding Application

Further, the design was developed into an application using Flutter programming. Tool used for coding on each page was Microsoft Visual Studio. The application development steps consisted of 1) open Microsoft visual studio application, select file and then select new folder; 2) create menu tools needed in file using file XML extension; 3) run debug application to display emulator; 4) create each page with functions that are interrelated for each page; 5) compiler with cordova to become APK; and 6) upload process on Play Store android. Example of the application development result is depicted in Figure 4.

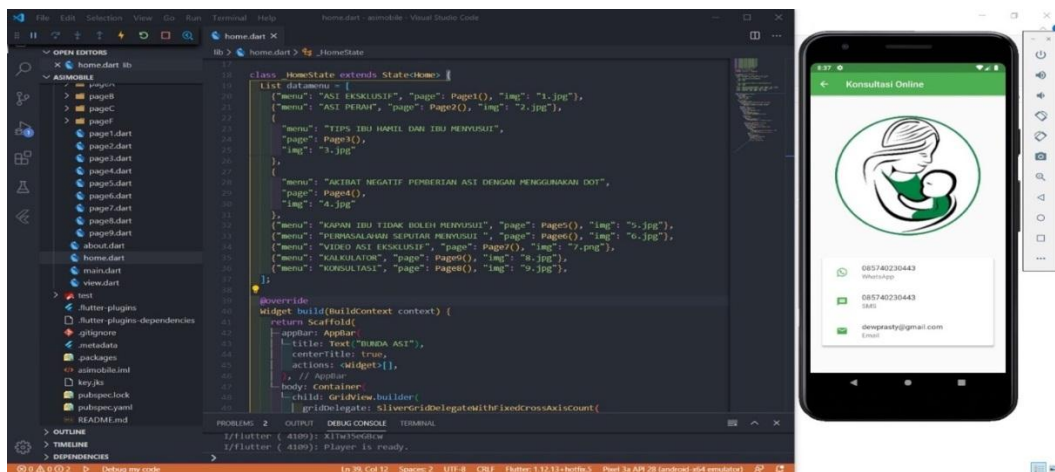


Figure 4. Example of One of Consultation Menus on “Bunda ASI” application

The development results were then handed over to media experts and breastfeeding experts. This activity was intended to measure validity level of the developed android-based exclusive breastfeeding consultation application system to improve pregnant mother’s attitudes and knowledge. The media expert, in this case, included lecturers with expertise in technology and information system. Aspects assessed consisted of visual design, navigation, mobility, content, and language. The media expert validation results are presented in Table 3.

Table 3. Assessment Results by Media Expert

No	Assessment Aspect	Average value
1.	Visual design	3.7
2.	Navigation	3.5
3.	Mobility	3.8
4.	Content	3.6
5.	Language	3,5
Average		3,6

Table 3 shows that the media validation results obtained an average value of 3.6 with a valid category; thus, it could be inferred that “Bunda ASI” application media was feasible to be implemented or used. The following

step was an assessment by the breastfeeding experts that consisted of pediatricians and breastfeeding consultants. The assessment aspect included exclusive breastfeeding knowledge, attitudes towards exclusive breastfeeding, and language. The breastfeeding expert validation results are described in Table 4.

Table 4. Assessment Results by Breastfeeding Experts

No	Assessment Aspect	Average Value
1.	Content	4.0
2.	Exclusive Breastfeeding Knowledge	3.5
3.	Attitudes towards exclusive breastfeeding	3.8
4.	Language	3.5
Average		3.7

Referring to Table 4, the breastfeeding expert validation results obtained an average value of 3.7 with a valid category; thus the “Bunda ASI” application was feasible to be implemented or used as regards its content. The next stage would be conducting a black box test to discover strengths and weaknesses of the developed android application. The test was carried out by asking assessment from 5 health workers at the Puskesmas Bae that consisted of physicians, midwives, and nutritionists. The black box test results could be seen in Table 5.

Table 5. Black Box Test Results

No	Assessment Aspect	Average Value
1.	Incorrect or missing functions	3.8
2.	Interface errors	3.7
3.	Data structures or external database access errors	3.9
4.	Performance errors	3.8
5.	Initialization errors	3.3
Average		3.7

Based on Table 5, the assessment results by users that consisted of 5 health workers obtained an average value of 3.7 with a valid category. It could be interpreted that “Bunda ASI” application was feasible to be implemented or used. It also indicated that the application could be applied by health workers to provide services to pregnant mothers regarding exclusive breastfeeding. In addition to the quantitative validation, the experts and users provide suggestions for improvement for the designed “Bunda ASI” application. Their inputs are presented in Table 6.

Table 6. Inputs for Improvement for “Bunda ASI” Application by the Experts and Users

No	Input	Follow up
1.	Add user manual menu on the application	Addition of user manual menu on the application
2.	Applying more interesting images/icons or use original images/icons	Substitute with original images and icons
3.	The breast milk intake calculator could not operate using decimal numbers	Improvement in calculator menu so as it can be used with decimal numbers
4.	In the “bottle pacifier-feeding effect ” menu should use similar content or display	Adjustment in display as other menus
5.	Add additional breastfeeding content. Images could be considered to be applied for easier understand	Add the breastfeeding attachment content
6.	Exclusive breastfeeding definition should be adjusted to that of WHO	Adjustment in breastfeeding according to WHO
7.	Presentation of breastfeeding position image was less clear	Improvement in image quality
8.	Presentation of tables with small size font and consist of many writings in one display should be rearranged to provide clear and easy user experience	Tables could be enlarged on screen display
9.	Benefits for country should be reviewed	Correction on the benefits for country according to breastfeeding application context

“BUNDA ASI” APPLICATION

The “Bunda ASI” application was improved as recommended by the experts and users. The application had 10 main menus, namely: *ASI eksklusif* (exclusive breastfeeding), *ASI perah* (milked breast milk), *tips ibu hamil dan menyusui* (tips for pregnant and breastfeeding mothers), *akibat negatif pemberian ASI dengan menggunakan botol dot* (negative effects of pacifier-bottle breastfeeding), *kapan ibu tidak boleh menyusui* (when mothers should not breastfeed), *permasalahan seputar menyusui* (issues in breastfeeding), *video ASI eksklusif* (exclusive breastfeeding videos), *kalkulator* (calculator), *konsultasi* (consultation), and *petunjuk penggunaan* (user manual). The application general display could be seen in Figure 5.

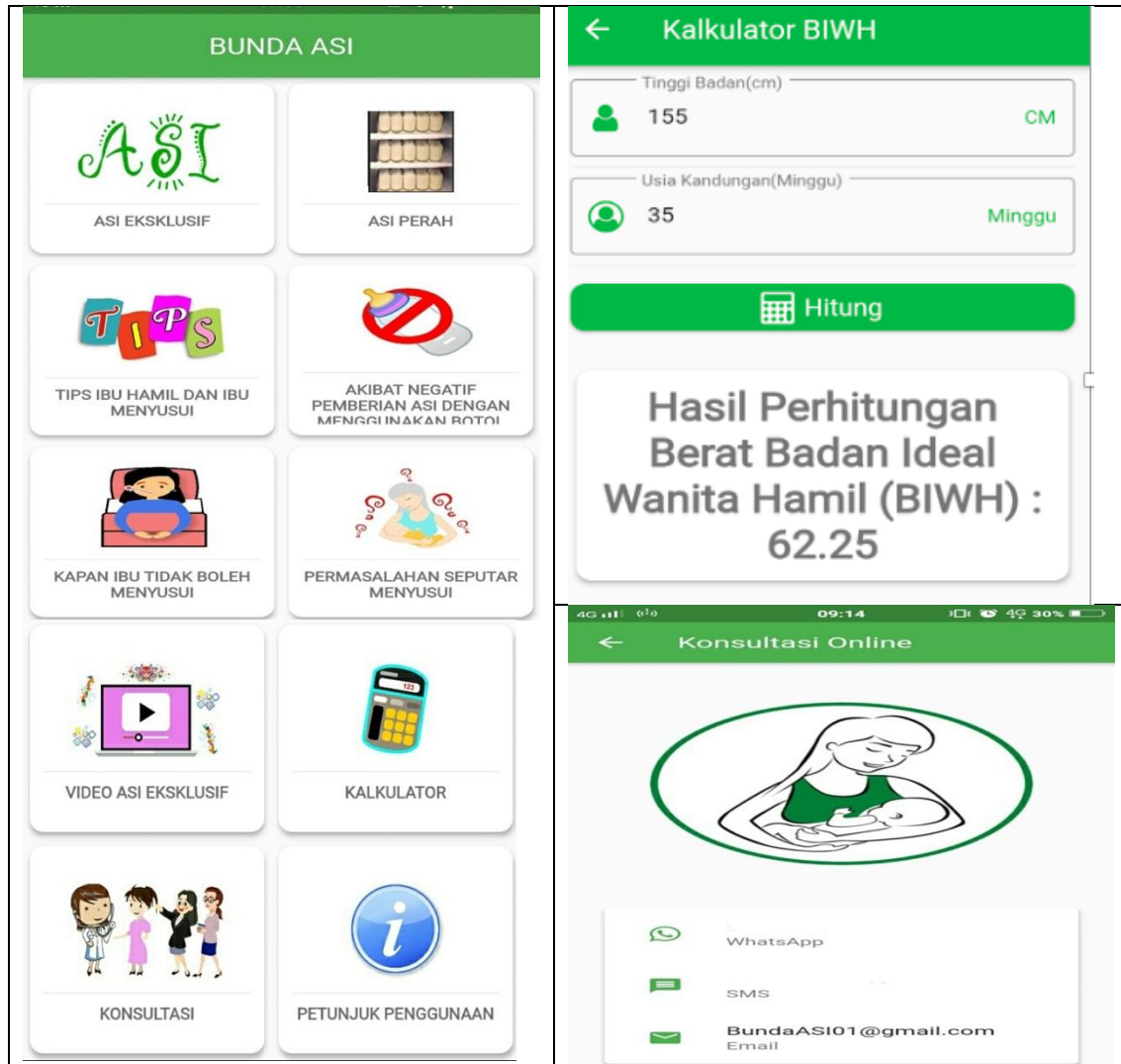


Figure 5. Screen of the “Bunda ASI” Application General Display

The “Bunda ASI” application has different characteristics compared to other application model in terms of its operational system used, which is android system. Menus available in the application provide information on exclusive breastfeeding equipped with videos. It also contains menu that allows users to have direct consultation with operators who are also health workers. The application model is equipped with a user manual menu; hence, users could use it independently without prior socialization. The application model could be downloaded from Play Store on android smartphones.

IV. CONCLUSION

According to the analysis, conclusions could be drawn as follows.

1. The research and development steps of the android-based “Bunda ASI” application consisted of: 1) Literature study and field analysis through survey research; 2) design; 3) development of android-based exclusive breastfeeding application; 4) expert validation; and 5) black box test.
2. The android-based “Bunda ASI” application was feasible to be utilized to improve pregnant mothers’ attitudes and knowledge and it serves as an innovation in exclusive breastfeeding promotional programs.

3. Further research and development includes the android-based “Bunda ASI” application implementation for pregnant mothers in Kudus Regency to improve attitudes and knowledge towards exclusive breastfeeding.

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