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Research Report

Electronic application for oral health school programme enhances the quality of the information in dental health data records

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ABSTRACT

*Background: Dental and oral health problems among elementary students can be resolved through an oral health programme in schools. The main factor that inhibited this scheme was that the recording and reporting still employed a manual system, making it less effective and efficient. The electronic application of this programme can help managers to complete both of these tasks. **Purpose:** This study's aim is to assess the effectiveness of the electronic application that is utilised in the oral health school programme to increase the quality of the information relating to the recording of dental health data in schools. **Methods:** This study used a pre-test and post-test one-group design, and the sample consisted of 37 oral health programme managers in schools who were chosen via simple random sampling. The data in this study was analysed using the Wilcoxon signed-rank test. **Results:** The results showed that the use of the electronic application as part of the oral health scheme influenced the quality of the information when details were recorded and reported. This can be seen in the rise in the standard of the information that was noted and disclosed when comparing data before and after using the electronic application; the average value of 1.54 (standard deviation=1.45) increased to an average value of 3.58 (standard deviation=2.84) with a significance level of 0.000 (p<0.05). **Conclusion:** The electronic application used in conjunction with the oral health programme was effective in raising the quality of dental health records in schools.*

Keywords: electronic application; oral health school programme; quality information; recording and reporting

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INTRODUCTION

Oral and dental health are a part of the overall well-being of the body, but they have often been neglected by some people. Keeping our mouths and teeth healthy is not only useful for chewing, talking and our appearance, it also supports our general welfare as living beings. World Health Organization (WHO) data for 2005–2015 showed that 90% of dental caries ware found in school-age children.[1] The Fit for School programme research conducted in Cambodia, Indonesia and Laos stated that 94.4% of children had caries in their primary teeth and 73.2% were shown to have odontogenic infections, which can cause disruptions to eating and sleeping, poor quality of life, school absence and growth retardation.[2] The results of the 2018 Basic

Health Research, or Riset Kesehatan Dasar (RISKESDAS), disclosed that 57.6% of Indonesia's population had dental and oral problems and only 10.2% received dental medical treatment. Meanwhile, in West Java, 58% of the populace had dental and oral health issues and only 11.9% had received treatment.[3]

However, often neglected dental and oral health problems in children can be overcome through a full integration of oral and dental health into public health promotion strategies and school health programmes. Such schemes in places of education teach children to maintain their oral and dental health and to comprehensively and continuously care for their mouths and teeth; thus, improving their health status in this regard. Collaboration between schools and health workers was an important

element in maximising this oral-health-based school programme. Nevertheless, there were obstacles in terms of accessing information, such as difficulties in providing information on the condition of children's oral health and the availability of details related to the programme with regards to schools and parents.[4]

The development of information and communication technology provided convenience when strengthening and developing health information systems. Currently, there is a need to utilise information and communication technology in the health information system to improve the management and implementation of the field's progression. These types of systems could be used as a tool to help oral health school programme managers provide data quickly and easily to schools, simplifying the process of monitoring performance and reporting activities online in a way that is both integrated and easily accessible by everyone.[5]

Recording and reporting were part of the health information system, which was an indicator of success when assessing a programme, and the details generated from the processed data could be used for planning subsequent schemes. Indeed, the information had an important role in the decision-making process. At the time, the recording and reporting of data in relation to the oral health school programme were still done manually, and the management team continued to use a book to record the results of the scheme's oral health activities in schools. Doing so was less effective and efficient because the person in charge of the scheme had to rewrite the results of said activities and had subsequent difficulties finding the relevant data; therefore, they took a relatively long time to compile the reports. Electronic recording systems in the health sector have emerged as a result of the development of information and communication technology, which has been utilised to improve the quality and efficiency of health services.[6] This kind of system could be easily accessed, reduce paper costs and diminish the number of problems when sharing information between patients and health workers. In addition, it could provide accurate and consistent care record details that are required for further maintenance,[7] which can lead to the sustainability and success of a programme.[8]

Furthermore, an electronic recording system could integrate data into one place that allows analysis to be done easily and quickly when making decisions. The use of electronic health records also leads to more comprehensive data input by patients, and can make examinations more accurate if a more detailed previous medical history has been given.[9] The electronic recording system makes it easy to find patient data and their histories, so it saves time and is more effective. Additionally, data pertaining to those being treated is stored more safely, meaning it is not easily lost and confusing patient data can be avoided. Android is an operating system for smartphones based on Linux, which is often used in the health sector as an innovation in the use of information technology. The advantage of Android compared to other smartphone operating systems

is that it employs an open-source code, making it easier for developers to create and modify applications or features that do not already exist within the operating system according to their wishes.[10]

The West Java Province School's health programme advisory team has created a MEDISis website application, which is a student health management information system. Its purpose is to store a history of the health and physical growth of students obtained through several measurements and examinations that can be done as part of the institution's healthcare scheme. Moreover, pupils can see the state of their well-being by using the aforementioned Android-based application. The aim is to use it to collate medical histories after they have been entered through the MEDISis website by the teacher or the MEDISis operator. The Faculty of Dentistry at Airlangga University has also developed the simdagilut application, which is an online-based information system website and a tool for data management for dental and oral health surveys. Dental health records on the MEDISis website and simdagilut used an odontogram, which recorded the dental health condition of school children, but did not explain in detail their dental and oral hygiene or the condition of any dental caries. The follow-up plan and the treatment carried out were also not included in the MEDISis and simdagilut applications. The simdagilut version of this digital tool only displays the status of immediate care needs without presenting the type of treatment needed.

The results of a preliminary study conducted at public health centres, or Pusat pelayanan kesehatan masyarakat (PUSKESMAS), in Bandung City show that the recording and reporting of oral health school programmes still utilises a manual system that involves the assist book. Indeed, MEDISis and simdagilut applications have not been used at all by these places in the city, and manual notation and reporting make it difficult to find dental health data records; consequently, dental health statuses and the related care required for each child have not been included in the oral health programme report in schools. In addition, data from the scheme as reported to the Health Office is still being combined with information from visits to PUSKESMAS and details from the community-based dental health programme. While the report on the oral health school programme is very important for determining policies or resolving problems related to oral health in elementary school children, the aim of this study is to investigate the effectiveness of the scheme's electronic application in increasing the quality of the information held in dental health data records in schools.

MATERIALS AND METHODS

This research has received approval from the Research Ethics Commission of Padjadjaran University (1505/ UN6.KEP/EC/2019) and has met the basic principles of ethics based on the Belmont Report, namely respect for

persons (respect for human dignity), beneficence and non-maleficence (principle benefit and not harming anyone) and justice. This research was conducted in Bandung City from December 2019 to April 2020.

The sample used in this study consisted of the managers of oral health school programmes in elementary schools within the working boundaries of the public health centre in Bandung City, and they were chosen via a simple and randomised sampling method. The researchers compiled a list of the names of public health centres, and made a paper containing the number of notes that corresponded to this list. The paper was rolled up for the purpose of a draw to select a sample with a predetermined number, and the numbers on the paper that were picked were selected as the research sample.

The inclusion criteria for this study were managers of oral health school programmes in elementary schools within the working parameters of health centres in Bandung City; having oral health schemes in the elementary schools within the aforementioned area; the ability to use an Android-based mobile phone that supports the programme's electronic application; and the propensity to operate said application. Concurrently, the exclusion criteria for this study was oral school programme managers who were not present at the time of the research. Meanwhile, the conditions for dropping out were the programme managers who resigned in the middle of the research. This study did not use a control group, and the treatment group alone was given a pre-test and post-test. The sample formula used pairwise numerical analytic research (two-average hypothesis testing with a single sample) as follows:

$$n = \left[\frac{(Z_\alpha + Z_\beta)\, S}{X_1 - X_2}\right]^2$$

Where: n = minimum sample size, Z_α = standard deviation of *alpha* / Z value to a certain degree of significance, Z_β = standard deviate *beta* / Z value at a given power test, S = standard deviation of the difference in value between groups, X_1 - X_2 = the difference between the minimum mean which is considered significant.

This study also used mean and standard deviation values based on the research by Hoogerheide et al.[11] because it was considered to be similar in nature, with a mean difference of 8.84 and a standard deviation of 0.12. Estimation was done with a 5% degree of significance and 90% test strength. Through the calculation of the sample size, the minimum number of subjects was 33 respondents. Anticipating contributors dropping out, the number of subjects was increased by 10%, meaning the total number of respondents was 37.[11]

This research was conducted using a pre-test and post-test one-group design. Respondents were asked to do a pre-test by filling out a questionnaire on the quality of the recording and reporting of information that is currently used, which still employs a manual system that involves the use of a book. The subject was then given an explanation of the uses of the oral health school programme's electronic application. After that, the researcher asked scheme managers to enter existing dental and oral health screening data, specifically in relation to first graders based on last year's screenings. The decision behind choosing this information in relation to this group of pupils was based on the programme's guidelines that dental and oral health screening should be carried out on first-grade students. After 30 days, those in charge of the oral health schemes in schools were asked to fill out a questionnaire (the post-test) that quizzed them in the same manner as the pre-test to assess the quality of recording and reporting after using the scheme's Android-based electronic application. This was completed on the Google Form sent by the researchers. During the applicable trial period of 30 days, the scholars involved monitored the activities of the oral health school programme managers when collecting apposite data using the aforementioned application.

The instrument used in this study was a questionnaire for assessing the quality of information recording and reporting on the oral health programme in schools, which consisted of 22 questions divided into four dimensions, namely the intrinsic, contextual, accessibility and representation elements. The assessment was carried out by the researcher and was assisted by the dental nurse. The independent variable in this study is the use of the electronic application, and its dependent counterpart is the quality of the recording and reporting information as part of the same scheme. The quality of the information can be measured from a person's point of view by using a product and service that is in accordance with users' expectations, and it can be quantified via the quality dimension method, which is a determining factor in the degree to which the benefits it contains have been achieved. Wang and Strong[12] categorised the dimensions of information quality as intrinsic, contextual, representation and accessibility.

The intrinsic dimension is a basic assessment that appears in relation to individuals that are using a product or service. This includes evaluating the accuracy, objectivity, content validation and the reputation of the information's source. The contextual dimension scrutinises the content of an interrelated detail to make it easier for users to receive information. Meanwhile, the contextual dimension relates to the relevance, added value, timeliness, reliability and completeness of information, and the representation dimension is a form of conveying information to users. The parameters of the presentation include the ability to interpret, ease of understanding and the conciseness/consistency of the way the data is presented. Lastly, the accessibility dimension assesses the ease of accessing information and the security system for guaranteed information or the existence of an arrangement for the sake of privacy.

The instrument used has been tested for its validity and reliability on 30 oral health school programme managers and was found to have a Cronbach's alpha value of 0.92 (very good), person reliability of 0.90 (good) and item

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reliability of 0.82 (good). The univariate analysis of the frequency distribution of general data, such as age, gender and education, can be utilised to describe the characteristics of each variable studied as well. In the meantime, bivariate analysis was used to determine the influence of the oral health programme's electronic application on the quality of recording and reporting in the scheme. The data was examined using IBM statistical analysis for social science (SPSS) software version 20 (IBM corporation, Illinois, Chicago, US), and the Shapiro-Wilk test was employed to assess its normality. Based on the Shapiro-Wilk test, it was found that the data was not normally distributed, so the next form of analysis used the Wilcoxon test and found a significant value of 0.000 (p< 0.05), which indicates a significant change.

RESULTS

In terms of the characteristics of the respondents in this study, 83.78% of them were female, 51.36% were aged 26–45 years, those with a DIII education accounted for 75.66% of contributors and 86.47% of the sample group worked as dental nurses. The quality of information recorded and reported during the activities completed by Android-based electronic application for oral health school programme were assessed based on users' perceptions regarding the standard of the data provided, and were assessed using the following scores: one (very poor), two (poor), three (sufficient), four (good) and five (very good).

Table 1 highlights the fact that the average value of the recording and reporting quality of the oral health school programme increased after using the associated electronic application; the overall improvement in the standard of notation and delineation after using the application went from an average value of 1.54 (standard deviation=1.45) to an average value of 3.58 (standard deviation=2.84) where a significant value of 0.000 (<0.05) indicates a noteworthy change. When viewed based on the dimensions of information quality, only the intrinsic, contextual and accessibility dimensions show significant changes with a significant value <0.05.

DISCUSSION

A high calibre of information was needed to support the success of the system's development. The results showed that the Android-based electronic application for oral health school programme gave influenced to the quality of electronic application for oral health school programme recording and reporting. This was in accordance with Salsabila's[13] research, which states that the use of an Android-based smartphone can be a ready-made means of shortening the time spent on data collection and automatic data processing. This android-based recording and reporting application can also minimise paper requirements; therefore, reducing the risk of lost and corrupted data and facilitating the creation of fast and accurate reports based on the data needed at the highest level.[13]

Android applications are mobile devices that provide a good platform to develop from, and they can be used as data collection systems. The relatively low cost, its portable nature and the ease of access to wireless networks where there is network range make these implements very attractive to users.[14] The results of Asgari's[15] research in Iran showed that electronic dental health records could provide benefits with regards to storage, processing and data utilisation, which were all major components in delivering effective and efficient service based on the available evidence. Digital versions of these records are more effective and efficient because they reduce paperwork, lead to the fast processing of data, facilitate ease of analysis and increase the accuracy, precision and quality of data. In addition, dental and oral health data records can be used in conjunction with programme planning and intervention.[15] In relation to this, Petersen et al.[16] found in their research that in constructive health-related decision-making and planning, the information system must cover aspects of risk factors associated with oral health and the quality of information related to it, services and interventions, administrative processes and the quality of clinical care outcomes as well as epidemiological details.

Using the school programme's Android-based application minimises errors when entering data, makes it easier to create reports and offers information about the status of oral

Table 1. Analysis of pre and post changes in the quality of electronic application for oral health school programme recording and reporting

Variable	N	Mean	SD	Min	Max	Significant value
Pre-all	37	1.54	1.45	-0.97	5.48	0.000
Post-all	37	3.58	2.84	-3.46	9.52	
Pre-intrinsic	37	1.15	2.30	-3.06	5.50	0.021
Post-intrinsic	37	-0.53	4.37	-8.50	8.29	
Pre-contextual	37	1.68	2.09	-2.50	6.73	0.044
Post-contextual	37	0.66	3.29	-7.08	6.90	
Pre-representation	37	1.74	2.05	-2.02	7.07	0.056
Post-representation	37	0.19	5.03	-9.65	9.64	
Pre-accessibility	37	1.33	2.64	-3.90	7.45	0.004
Post-accessibility	37	2.89	2.76	-3.14	8.19	

health that can be used when making choices that bolster dental and oral health schemes. This was in keeping with what Detsomboonrat's et al.[17] discovered in 2019, which was that Android applications can be used to assist health care professionals in carrying out many important tasks, including time management, maintenance of and access to medical records, consultation, referrals, information gathering, clinical decision-making and educational health. The application was seen to be capable of reducing the number of errors and the time spent on data recording, and it could provide a good system for collecting information that can be used to assess the dental and oral health status of a population to determine policies and strategies that support dental and oral health programmes.[17]

The success of the information system was assessed by ascertaining the level of usefulness of the information when making reports and settling on related decisions. Its degree of accomplishment could also be scrutinised from the perspective of the information generated as its quality was indispensable when the validity of the system's development needed to be verified. The dimension of information quality was an approach used to measure the standard of data from the aforementioned electronic application based on users' perceptions as user perception has become the most important factor in determining the value of the information supplied because everyone's needs are different in this respect.[18]

In this study, measurements of the information in relation to the programme's recording and reporting were undertaken using Wang and Strong's theory,[12] which divides the data into four strata: intrinsic, contextual, presentation and accessibility. The results of the influence analysis when using the school scheme's electronic application to affect the quality of recording and reporting on oral health from each of these subdivisions showed that the ones that had a meaningful influence were the intrinsic, contextual and accessibility dimensions; meanwhile, the representation dimension was shown to have an insignificant bearing.

The intrinsic dimension assessed the accuracy, objectivity and validity of the informational content as well as the reputation of the source of the data. The electronic application used in conjunction with the oral health programme in schools provided details that were free from the errors that may usually occur in the implementation of data processing, because it can automatically provide the results of the calculation of the dental hygiene index. The presentation of accurate information was vital as what was provided from the source to the recipient can cause interruptions and mistakes that can damage the data collated from the information. The material gathered by the programme's application reflected the actual conditions and was in accordance with the requirements of the oral health manager in the specified schools. Furthermore, the application presented information in an objective, complete and reliable manner, and the users' trust in the details it offered showed that the information has a high level of credibility. This is supported by Hazen's et al.[19] who

asserted that the quality of the information depends on the accuracy of the data in line with the actual situation.

The contextual dimension assessed the relevance, added value, timeliness, reliability and completeness of the information. The application linked to the aforementioned school programme provided details that were relevant to the oral health scheme, meaning they complete and useful for recording and reporting on it. Complete information was imperative for both the provider and the recipient of the information, so that it can be understood clearly. The electronic application also helped the programme managers to create reports on time as they no longer need to make repetitive notes. Information must be given in a timely manner so that its recipient is not too late to act, or to make decisions based on what has been brought to light. Moreover, the scheme's application provided added value, because it could automatically calculate the status of dental and oral health and generate reports that can be downloaded directly onto it. This was consistent with the findings of a study by Lee et al.[20], which stated that in the contextual dimension, users must make relevant, timely, complete and accepted considerations, which has added worth when providing changes to existing information, making it superior in terms of how it can be utilised.

The representation dimension assessed the ability of interpretation, ease of understanding and the conciseness and consistency of presentation. The electronic application that was employed during the oral health scheme provided information that was easy to understand, systemic, consistent, in accordance with the reported needs and that could facilitate the production of reports on time. The use of clear and succinct language was also an added value when assessing the quality of the information. Good recording and reporting produced statistics that did not conflict with previous information and did not vary. The results also underlined that the electronic application had no significant effect on the dimensions of the presentation. This was because the oral health program managers in schools had only just recently been introduced to it, meaning that they were not familiar with its employment. Consequently, those in charge of the above oral health schemes were confused by application, so they had to ask about how to use it once again. This is supported by research by McGill et al.[21], which proposes that the utilisation of developed information systems should refer to how often users employ them; the more often they use information systems, the more they learn about them.[21]

The accessibility dimension assessed the ease of accessing information as well as the standard of the security system for guaranteed information or the existence of a system for privacy. The aforementioned application can be accessed without difficulty to get the information needed when the programme leader wants to make important decisions, which can in turn increase the success of such a scheme. The quality of the information was determined by its availability; in other words, the extent to which it can be retrieved whenever and wherever it is necessary. Failure to

access the school programme's electronic application was found to occur if the internet network was interrupted or if it was in the process of being maintained. The application was also equipped with a data security system, and the information that was presented had a privacy system, which meant that the data stored in the application could not be easily corrupted by means of duplication, dissemination or by being changed by irresponsible people.[22]

Information quality was often measured as a major component of user satisfaction. Indeed, the quality of the information was a determining factor in increasing the intention to use information technology. If users believed in the quality of the system they were utilising and felt that it was not difficult to use, they would then believe it would provide greater benefits and could optimise their performance. If the information generated by the system was more accurate, timely and exhibited a good degree of reliability, it will further increase user confidence in the system. Rai et al.[23] came to similar conclusions, stating that an increase in the trust of users of information systems was expected to further improve one's performance. Nevertheless, with regards to the limitations of this study, the electronic application for oral health school programme that was used is still a prototype, so suggestions are needed for further improvement and development. Additionally, the details entered into the application were secondary data due to circumstances that make it impossible to carry out direct dental health checks on elementary school students.

Based on the results of the research on the influence of the Android-based electronic oral health school programme application on the quality of recording/reporting in elementary schools around the working parameters of the public health centre in Bandung City, it can be concluded that the tool was effective in increasing the calibre of the information contained in dental health records. The above application was utilised in accordance with the needs of the scheme's managers and the existing conditions, so that it could be a solution to the problems associated with the manual recording and reporting system. It made these dual tasks effortless, prevented the necessity for repetitive work and could be accessed at any time. This research has contributed to enriching studies in the field of public dental health and producing new innovations regarding the electronic application for oral health school programme, which is used for noting down and delineating dental health in schools. It was hoped that the Android-based electronic application relating to the oral health school programme can be used as a medium for recording and reporting in order to monitor the dental and oral healthcare of elementary school students.

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