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Developing Systems Application Based on Android as Tool for Determinant Stunting Factors in the COVID-19 Pandemic Era

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***Abstract*---**The purpose of this study is to build an integrated survey application software with android-based stunting determinants and websites to obtain a centralized baseline dataset. The application is intended to prepare centralized data on stunting determinants in the Covid-19 pandemic era, then in the direction of further research it can be developed into artificial intelligence (AI)-based stunting detection applications. Method. This research consists of two stages, the Research Stage using qualitative methods and the system development stage using the Software Development Life Cycle (SDLC) method with the PADI concept (Planning, Analysis, Design, and Implementation). This research was conducted in several areas of Blora Regency from January to September 2021 with a total of 300 respondents and 78 questionnaire questions. Result. This research is an application of the Nutrition Status Detection System (SITEKSTAGI) based on a website and android phone with a centralized questionnaire data collection feature. Conclusion From the results of system testing, the sitekstagi application to monitor and collect questionnaires can work smoothly and well.

***Keywords*---**android, detection, diagnosis, SITEKSTAGI, stunting.

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Introduction

Stunting is a condition of failure to thrive so that children are too short for their age (Suhron et al., 2020; Suhron & Zainiyah, 2021). The new stunting condition appears after the baby is 2 years old, it can be seen with indicators of body length / age or height / age according to WHO or by looking at the z-score value below the standard deviation (-2 or - 3) (Perumal et al., 2018). The impact of stunting will affect cognitive to psychological functions, not only in children but also in families of stunted children such as stress Suhron (2016); Suhron (2017), and changes in parents' self-esteem Suhron & Amir (2018); Suhron et al. (2019); Marasabessy et al. (2020), work productivity, and the risk of suffering chronic disease (Sanou et al., 2018; Rahmawaty & Meyer, 2019). Furthermore, stunting can increase the risk of morbidity and mortality, inhibition of brain development, causing suboptimal motor and mental development of toddlers (de Onis & Branca, 2016; Mitra & Gilbert, 2015). Psychological conditions in parents of stunting children result in psychological stress disorders (Yusuf et al., 2019; Suhron et al., 2017).

Stunting toddlers include chronic nutritional problems caused by several factors either directly or indirectly such as socioeconomic status, maternal nutrition during pregnancy, infant pain Vilcins et al. (2018); Syed et al. (2019), and inadequate intake of nutritional intake in infants. The results of the analysis of stunting factors throughout Southeast Asia show lower birth weight (LBW), maternal education level, household income, and lack of home sanitation hygiene Sanou et al. (2018); Rakotomanana et al. (2017), the greater the risk of toddlers becoming stunted (Apriluana & Fikawati, 2018). Another factor that can affect the occurrence of stunting is directly related to infants, namely breast milk (ASI) Harrison et al. (2020), which is the best food for babies where breast milk contains white blood cells Khan et al. (2019), protein and immune substances (Miller & Rodgers, 2009). The COVID-19 pandemic has had an impact on the socioeconomic and health sectors where overburdened health facilities Prentice (2017); Owino et al. (2016), disrupted food supply chains, and loss of income due to COVID-19 can lead to an increase in the number of children experiencing nutritional problems in Indonesia (Headey et al., 2020). The impact of the COVID-19 pandemic is that the number of children under 5 years of age experiencing malnutrition, including stunting, has increased globally by around 15 percent (Akombi et al., 2017).

Early detection of causative factors and diagnosis of stunting is an important action in stunting prevention and control efforts (Ettyang et al, 2019; Bhutta et al 2020; Apriluana & Fikawati, 2018). The diagnosis of stunting is carried out by measuring stunting indicators such as body weight and length or by biochemical markers of growth and development (Bhutta et al 2020). However, there are many obstacles in the diagnosis of stunting, including taking a long time and large costs and there are still many challenges that must be faced when carrying out surveys at both the regional and central levels. In some cases, this goes according to the planned program but with some deficiencies and in some cases monitoring is often overlooked, due to the large amount of data and data that is not organized so that it is very burdensome for human operators. Besides that,life in the new normal era in the COVID-19 pandemic with health protocols demands changes in

health services, one of the techniques developed is using digital applications, including to detect stunting factors (Lawaceng & Rahayu, 2020).

Method

This research is a system development research, so this type of research is Research and Development research, according to Sugiyono the Research and Development method can be interpreted as a scientific way to design, produce and test the validity of the products that have been produced (Sugiyono. Research and Development Methods. 1st ed. Bandung: Alphabeta, 2). This research phase uses a qualitative approach to find out the problems and needs of android-based applications and websites in monitoring and collecting questionnaires related to stunting. The next stage is the Development system using the Software Development Life Cycle (SDLC) PADI concept (Planning, Analysis, Design, Implementation).

At the research stage, the data collection method used is documentation, where data collection is obtained through reference books and journals about stunting. At this stage, an analysis of the need for the system to be developed is carried out, including analyzing the menu, features/functions and the required interface. The system development stage is the stage of building a complete system that will be carried out by researchers using the SDLC-PADI method. The steps are as follows:

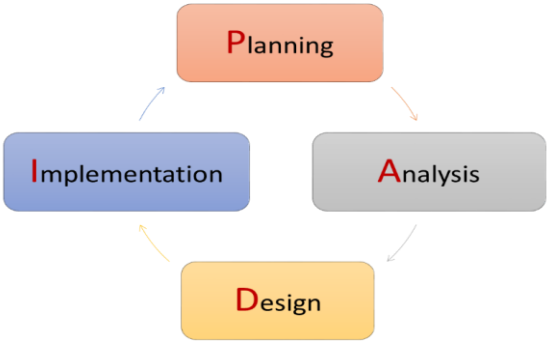

Figure 1. SDLC-PADI method

Planning

At this stage, it explains that SITEKSTAGI is the basis for obtaining datasets used in data learning with the concept of Artificial Intelligence (AI). SITEKSTAGI is conditioned to support the concept of ease of data collection by the reporter and validation by the verifier. SITEKSTAGI is built in an online condition (with internet) and must support existing concepts and be easy and safe for all. So that the general features can be explained as follows:

Table 1
General features of SITEKSTAGI

FEATURE	DESCRIPTION
Responsive Display	Creates a display that adjusts the screen size on all device screens (computers / laptops / smartphones). And can be accessed through the browser and the application is available on Google Play.
Load Page Speed	Programming language techniques Ajax and json that will speed up the process of calling website content pages.
Data Security	For security several security techniques are, such as data security against sql injection, htaccess, encryption and description of POST and GET delivery, etc.
Data Archiving	Data archiving can be integrated easily and quickly accessed (for example in the process of uploading, searching data and downloading files)
Multi User	The granting of system access rights or tasks varies according to the level of function and authority of all related parties

Table 2
Technical feasibility

Risk	REMARK
The risk of application familiarity is relatively light	The problem of not understanding the use of SITEKSTAGI to users will be resolved through socialization/training and video tutorials/guidebooks for using the application are provided.
The risk of technology familiarity is moderate.	The user already has a computer / laptop / smartphone device that is suitable for operation. Hardware tools to run applications are not many and do not require high specifications. Easy continuous software development with the application of native HTML5, CSS3, Jquery, PHP, Mysql, Ajax, Java and Json coding techniques with phpmyadmin and Android Studio tools.
The risk of project size is moderate	. This project team involves 1 system analyst and 1 programmer with maximum project completion time not exceeding 3 months.
Compatibility of technical infrastructure is quite good.	Users only need to use a browser on each device to access it. Or you can download and install it via the Google Play Store for easy access for Android smartphone users.

Table 3
Economic feasibility

Benefit of service	Cost reduction assumption
a. Ease of collecting questionnaire data as material for forming a dataset of factors	In this first year, several benefits related to costs can be felt, such

causing stunting. b. Ease of control over child data questionnaire validation. c. Ease of searching, uploading, downloading the history of the formed children's questionnaire data reports. d. There is an integration process between system actors so as to prevent data redundancy or duplication. e. As a means of supporting the basic framework for the formation of software development based on Artificial intelligence for the next research.	as: a. Reduced cost of printing questionnaire forms to be distributed new or reprinted to children's questionnaire data collectors. b. Reduced budget for activities to form or recapitulate reports on questionnaire form data that have been formed.

Organizational feasibility

From an organizational perspective, SITEKSTAGI in this study is one of the integrated support services for the presentation of research datasets for related parties in it. Another benefit of this system is that this system can be made sustainable until it can be felt by the general public, especially in providing detection information and advice on the condition of children automatically from the system (Sulaihah et al., 2020).

Analysis

At this stage, it explains the analysis related to the menu needs of each user as well as the hardware needs to support SYSTEM. The image below illustrates the role of each user with access rights in running the menu on SITEKSTAGI.

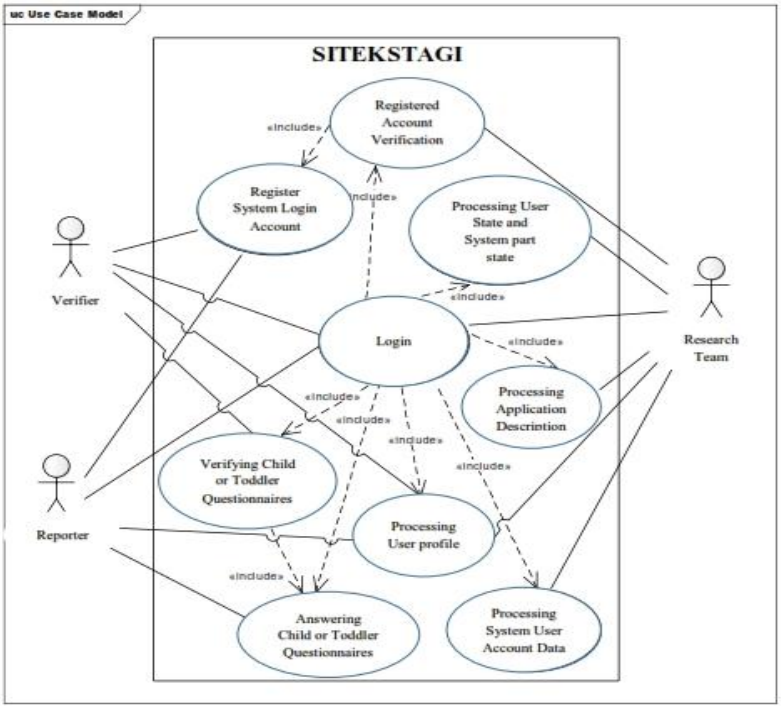

Figure 2. SITEKSTAGI model

The following is a table of server specifications for this research which is applied to the SITEKSTAGI software.

Table 4
Server specifications for this research which is applied to the SITEKSTAGI software

No	Specifications	Internet/Online
1.	Processor	2 Core
2.	Memory / RAM	1534 MB
3.	Hard Drive	SSD 100 GB
4.	Bandwidth	Unlimited
5.	Platform	(Apache, PHP, MySQL)
6.	Url Security	SSL
7.	Programming Support	AJAXJquery, JSON, CSS3 and HTML5

Design

At this stage, the application design is carried out, creating the necessary databases and creating menus and the STEKSTAGI display interface. The following is a view of the database design created to support its planning and analysis.

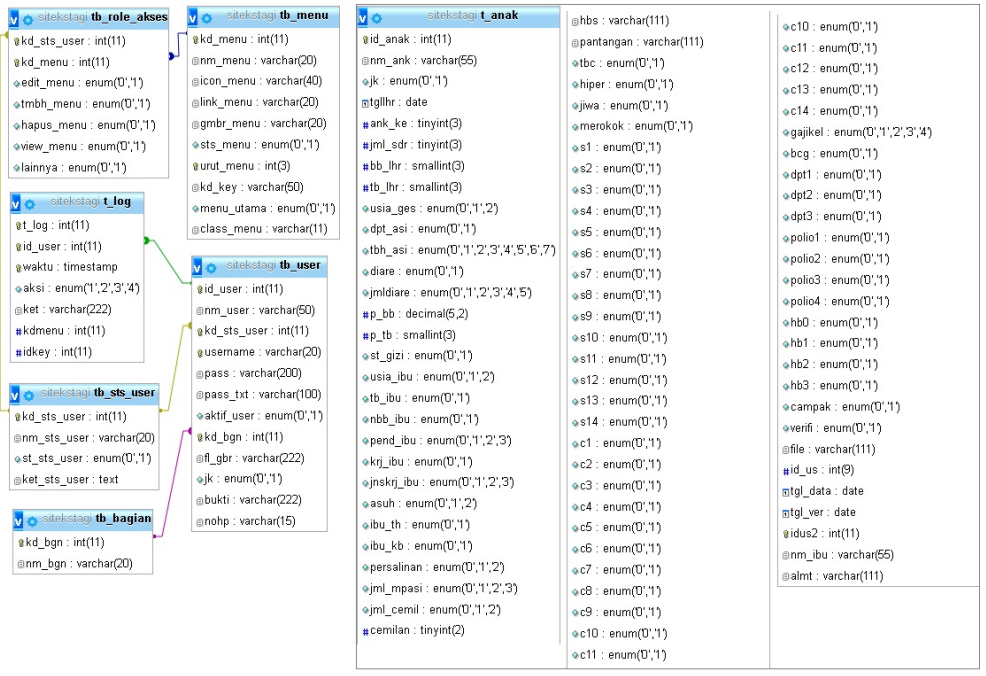

Figure 3. STEKSTAGI Display Interface

Implementation

At this stage, SITEKSTAGI is tested first and then immediately socialized to users. If there are still shortcomings in the implementation, then the application development/repair is carried out immediately by starting it again in the PLANNING process.

Result

The application developed in this study was tested using the google chrome browser and installed on Android version 5.0 Lollipop and above. The url address to access the application through the google chrome browser is https://sitekstagi.com/ and the installation source on android by searching for keywords sitekstagi and click install on google play. The following is the login display (a), menu collection (b), user account processing content page (c), child questionnaire content page (d), data recap information page (e), profile and password change page (f), change page application information (g), the display of android shortcut icons (h).

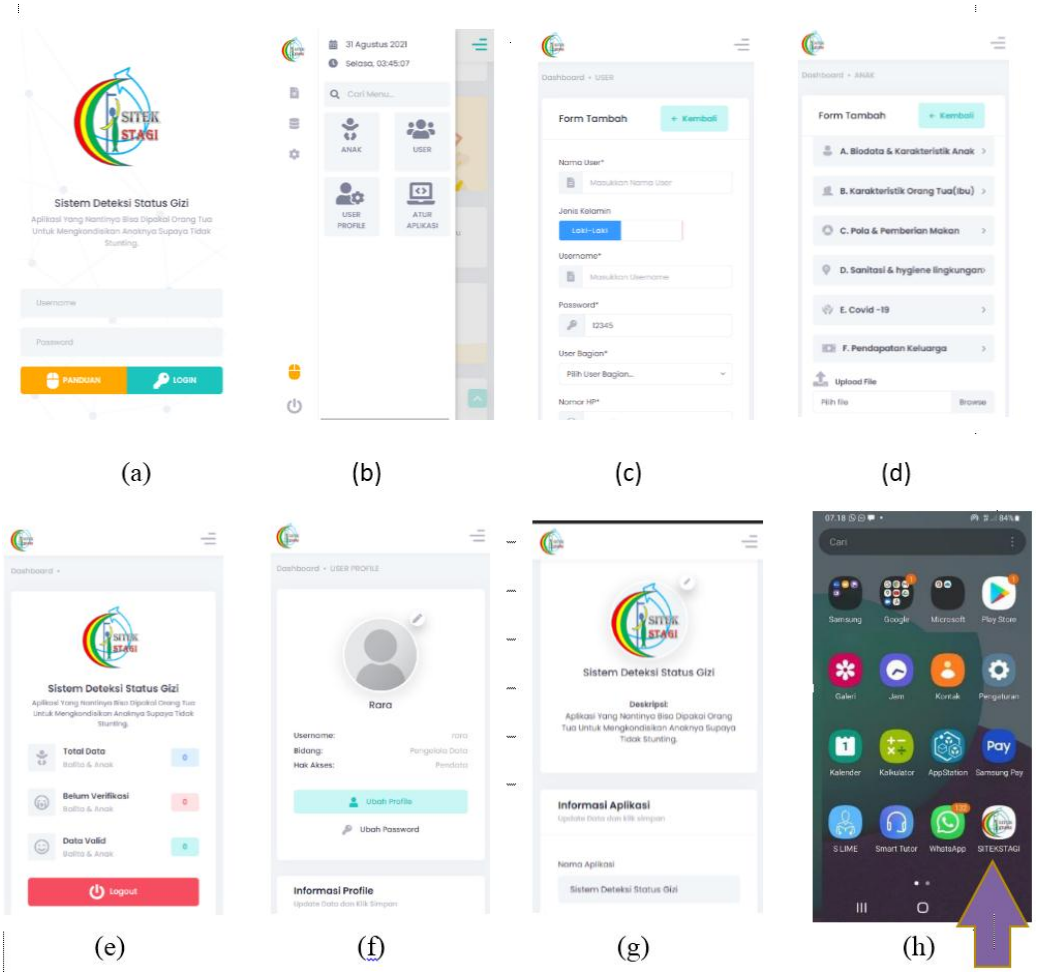

Figure 4. STEKSTAGI display

Discussion

This system is tested using the Black Box method, which focuses on the functional requirements of the system made. The tester (testing officer) defines the input conditions and tests each system function specification. Each system function is tested, whether it is in accordance with the purpose of the function and whether the function is running well. The test results show that the system created has met the functionality aspect because it has met the Blank Box test. There is also a discussion about Usability Testing to find out which variables are important and needed in the SITEKSTAGI design process. The usability testing method of this study uses a questionnaire method based on the user respondents of the SITEKSTAGI data collection level. Initially, each respondent is given several tasks or tasks that must be done first, where the tasks are as shown in the table below:

Table 5
The tasks respondents SITEKSTAGI data collection level

No	Task / Tasks
1.	Login to Application, select the user profile menu, then logout and log back in.
2.	Select the Children menu and click the dashboard button to return to the home page.
3.	Select the User profile menu and click the change password button
4.	Fill in the old password and new password then click the save button
5.	Select the Children menu, click the Add Child data button
6.	Fill in the existing questionnaire and then click the save button
7.	Change and delete data child on the child menu page

After the user completes each task / task, then distributes 15 questionnaire questions to 25 respondents, where each question represents 5 aspects of usability measurement. There is a Likert scale concept where at the left end (low number) describes a negative answer, while on the right (high number), describes a positive answer. The Likert scale was made to ensure that respondents answered at various levels each question item or questionnaire statement. The level of answers to the questionnaire items addressed to respondents uses a scale of 1 to 5.

The following is the average result of each of the 5 aspects of usability measurement on the entire questionnaire that has been distributed to respondents: (a) Ease (Learnability) which is measuring how easy and how skilled the user is. In learning how to run the application for the first time. The results of this aspect of the questionnaire obtained an average result of 3.95 (78.93 %). The results of this aspect of the questionnaire obtained an average result of 4.07 (81.49%). (c) Easy to remember (Memorability) which measures the extent to which users can remember the flow of steps or processes in achieving their goals. The results of this aspect of the questionnaire obtained an average result of 4.11 (82.19%). (d) Errors, namely measuring how often users make mistakes and whether users can easily overcome these errors. The results of this aspect of the questionnaire obtained an average result of 4.28 (85.55%). (e) Satisfaction, namely how users feel when using or responding to the overall system design of the system. The results of this aspect of the questionnaire obtained an average result of 4.22 (84.32%). So that the overall results of the processed components are obtained with an average value for the application of the nutritional status detection system of 4.13 (82.49%) or it can be said that the system that has been made has received a good assessment and has successfully fulfilled the usability aspect of the system.

Conclusion

The website and android based SITEKSTAGI application has been completed and can be operated properly during testing on every device (PC/Laptop/Mobile Phone) via the Google Chrome browser and can be installed and operated on the Android operating system version 5.0 Lollipop and above. Based on the usability system aspect testing, good results were also obtained with an average value of

4.13 (82.49%), thus confirming that this application is feasible to be used and developed in a sustainable manner. With this application, it can make it easier for health workers to collect questionnaire data centrally. And further development is needed to add the detection feature of existing dataset analysis based on the Artificial Intelligence (AI) Algorithm, so it is hoped that its application will be more useful in general or broadly.

References

Akombi, B. J., Agho, K. E., Hall, J. J., Merom, D., Astell-Burt, T., & Renzaho, A. (2017). Stunting and severe stunting among children under-5 years in Nigeria: A multilevel analysis. *BMC pediatrics*, *17*(1), 1-16.

Apriluana, G., & Fikawati, S. (2018). Analisis Faktor-Faktor Risiko terhadap Kejadian Stunting pada Balita (0-59 Bulan) di Negara Berkembang dan Asia Tenggara. *Media Penelitian dan Pengembangan Kesehatan*, *28*(4), 247-256.

Bhutta, Z. A., Akseer, N., Keats, E. C., Vaivada, T., Baker, S., Horton, S. E., ... & Black, R. (2020). How countries can reduce child stunting at scale: lessons from exemplar countries. *The American journal of clinical nutrition*, *112*(Supplement_2), 894S-904S.

de Onis, M., & Branca, F. (2016). Maternal and Child Nutrition. Vol. 12.

Ettyang, G. A., Sawe, C. J., & Ayiro, L. P. (2019). Stunted Too Early: Analysis of the Cambodia and Kenya 2014 Demographic and Health Survey Data.

Harrison, E., Syed, S., Ehsan, L., Iqbal, N. T., Sadiq, K., Umrani, F., ... & Ali, S. A. (2020). Machine learning model demonstrates stunting at birth and systemic inflammatory biomarkers as predictors of subsequent infant growth–a four-year prospective study. *BMC pediatrics*, *20*(1), 1-10.

Headey, D., Heidkamp, R., Osendarp, S., Ruel, M., Scott, N., Black, R., ... & Walker, N. (2020). Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. *The Lancet*, *396*(10250), 519-521.

Khan, J. R., Chowdhury, S., Islam, H., & Raheem, E. (2019). Machine learning algorithms to predict the childhood anemia in Bangladesh. *Journal of Data Science*, *17*(1), 195-218.

Khare S, Kavyashree S , Gupta D, Jyotishi A. Investigation of Nutritional Status of Children based on Machine Learning Techniques using Indian Demographic and Health Survey Data. Procedia Comput Sci [Internet]. 2017;115:338–49. Available from: https://doi.org/10.1016/j.procs.2017.09.087

Lawaceng, C., & Rahayu, A. Y. S. (2020). Tantangan Pencegahan Stunting pada Era Adaptasi Baru "New Normal" melalui Pemberdayaan Masyarakat di Kabupaten Pandeglang. *Jurnal Kebijakan Kesehatan Indonesia: JKKI*, *9*(3), 136-146.

Marasabessy, N. B., Suhron, M., & No, J. R. M. (2020). Stress Family Experience And Profiles Of Tumor Necrosis Factor Alpha And Interleukin-10 Of Nuaulu Tribe Community With Hunting Activity In Mesoendemic Area Of Malaria. *Systematic Reviews in Pharmacy. SRP*, *11*(11), 1886-1891.

Miller, J. E., & Rodgers, Y. V. (2009). Mother's education and children's nutritional status: new evidence from Cambodia. *Asian Development Review*, *26*(1), 131-165.

Mitra, T., & Gilbert, E. (2015). Credbank: A large-scale social media corpus with associated credibility annotations. In *Proceedings of the International AAAI Conference on Web and Social Media* (Vol. 9, No. 1, pp. 258-267).

Owino, V., Ahmed, T., Freemark, M., Kelly, P., Loy, A., Manary, M., & Loechl, C. (2016). Environmental enteric dysfunction and growth failure/stunting in global child health. *Pediatrics*, *138*(6).

Perumal, N., Bassani, D. G., & Roth, D. E. (2018). Use and misuse of stunting as a measure of child health. *The Journal of nutrition*, *148*(3), 311-315.

Prentice, A. M. (2017). Stunting in developing countries. *World review of nutrition and dietetics*, *117*, 165-175.

Rahmawaty, S., & Meyer, B. J. (2020). Stunting is a recognized problem: evidence for the potential benefits of ω-3 long-chain polyunsaturated fatty acids. *Nutrition*, *73*, 110564.

Rakotomanana, H., Gates, G. E., Hildebrand, D., & Stoecker, B. J. (2017). Determinants of stunting in children under 5 years in Madagascar. *Maternal & child nutrition*, *13*(4), e12409.

Sanou, A. S., Diallo, A. H., Holding, P., Nankabirwa, V., Engebretsen, I. M. S., Ndeezi, G., ... & Kashala-Abotnes, E. (2018). Association between stunting and neuro-psychological outcomes among children in Burkina Faso, West Africa. *Child and adolescent psychiatry and mental health*, *12*(1), 1-10.

Suhron, M. (2016). Self-esteem nursing care: Self-esteem/Self-concept nursing care: Self-esteem (Self-esteem nursing care).

Suhron, M. (2017). Care of Mental Nursing The Concept of Self-Esteem. *Jakarta: Mitra Wacana Media*.

Suhron, M., & Amir, F. (2018). Reduce Violent Behavior Schizophrenia: A New Approach Using LT (Laughing Therapy) and DRT (Deep Relaxation Therapy). *Indian Journal of Public Health Research & Development*, *9*(8).

Suhron, M., & Zainiyah, Z. (2021). How Were Stress Family and INSR (Insulin Receptor) Expression in Polycystic Ovary Syndrome (PCOS) Insulin Resistant in Madurese Tribe?: Indonesia. *Systematic Reviews in Pharmacy*, *12*(1), 170-175.

Suhron, M., Sulaihah, S., & Yusuf, A. H. (2017). Model of Potential Strengthening and Family Roles in Improving Family Members for ODGJ Adaptability. In *Proceeding of The 2nd International Symposium of Public Health* (pp. 344-351). Faculty of Public Health Universitas Airlangga.

Suhron, M., Yusuf, A., & Subarniati, R. (2019). Assessment of Stress Reactions and Identification of Family Experiences in Primary Care Post Restrain Schizophrenia in East Java Indonesia. Mix Method: Sequential Explanatory. *Indian Journal of Public Health Research & Development*, *10*(12).

Suhron, M., Yusuf, A., Subarniati, R., Amir, F., & Zainiyah, Z. (2020). How does forgiveness therapy versus emotion-focused therapy reduce violent behavior schizophrenia post restrain at East Java, Indonesia. *International Journal of Public Health*, *9*(4), 314-319.

Sulaihah, S., Hanik, E. N., Suhron, M., Hari, B. N., Mundakir, M., & Esti, Y. (2020). The Role Of Families Caring For People With Mental Disorders Through Family Resilience At East Java, Indonesia: Structural Equation Modeling Analysis. *Systematic Reviews in Pharmacy*, *11*(9), 52-59.

Syed, S., Al-Boni, M., Khan, M. N., Sadiq, K., Iqbal, N. T., Moskaluk, C. A., ... & Brown, D. E. (2019). Assessment of machine learning detection of environmental enteropathy and celiac disease in children. *JAMA network open*, *2*(6), e195822-e195822.

Vilcins, D., Sly, P. D., & Jagals, P. (2018). Environmental risk factors associated with child stunting: a systematic review of the literature. *Annals of global health*, *84*(4), 551.

Yusuf, A., Suhron, M., & Subarniati, R. (2019). Assessment of the Kempe Family Stress Inventory in self-care post-restrain schizophrenia. *International Journal of Public Health Science (IJPHS)*, *8*(2), 55-59.