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ENHANCING KNOWLEDGE AND AWARENESS FOR MEASLES AND RUBELLA ELIMINATION TO PREVENT CONGENITAL RUBELLA SYNDROME IN KULON PROGO AND GUNUNGKIDUL REGENCIES

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ABSTRACT

Introduction: Measles-Rubella (MR) Vaccination coverage is important in eliminating Congenital Rubella Syndrome (CRS). In 2023, Kulon Progo and Gunungkidul Regencies recorded 98.59% and 97.63%, respectively. We conducted campaign activities, introduced the Measles-Rubella (MR) vaccine, and implemented educational efforts crucial for controlling measles, rubella and CRS. A collaborative educational program was organized to improve the quality of promotive and preventive education provided to health workers and elementary teachers. **Aims**: To enhance the knowledge of health workers and elementary teachers regarding measles, rubella, CRS and elimination strategies in Kulon Progo and Gunungkidul Regency. **Methods:** This study employed a quasi-experimental, non-randomized design with no control group. The participants were selected from all primary health care centers and selected elementary schools in Kulon Progo and Gunungkidul Regency. Before and after a multi-modal educational program, knowledge of participants was measured using questionnaire and analyzed using Wilcoxon signed-rank test. **Results:** We included 72 health workers and 8 elementary teachers in Kulon Progo and Gunungkidul Regency. The results indicated an increase in knowledge among health workers regarding these topics. However, elementary teachers did not demonstrate statistically significant improvements in knowledge level, likely due to the small number of participants and a general lack of knowledge about these subjects among teachers. **Conclusion:** Multi-modal intervention enhanced the knowledge of health workers and elementary teachers about measles, rubella, CRS, elimination strategies of these diseases in two regencies of the Special Region of Yogyakarta. Therefore, it is essential that public health authorities should prioritize continuous and accessible education programs for them.

Keywords: measles-rubella; vaccination; congenital rubella syndrome; promotive

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INTRODUCTION

Measles and Rubella are preventable viral diseases (Ministry of Health Indonesia, 2023). Measles, also known as rubella, is a highly infectious disease characterized by symptoms such as fever, cough, runny nose, eye inflammation, and a unique rash. It spreads via respiratory droplets and is identified by fever, rash, and respiratory symptoms, with Koplik spots often present before the rash (Bester, 2016; Bangs et al., 2022; Kondamudi and Waymack, 2024). Complications occur in 30% to 40% of cases, especially among young, elderly, and malnourished individuals, with pneumonia being the most common (Bester, 2016; Bangs et al., 2022; Kondamudi and Waymack, 2024)

Rubella, or German measles, is generally milder than measles (Levin et al., 2023). This illness mainly impacts children and young adults without immunity, causing mild fever, fatigue, swelling of lymph nodes (especially behind the ears and in the lower back of the head), and a rash that begins on the face and spreads within a day (Masresha et al., 2019; Terracciano et al., 2020; CDC, 2022; Leonor and Mendez, 2023). The virus spreads through contact with infected nasal or throat secretions or respiratory droplets (Terracciano et al., 2020). Approximately 20-50% of infections are asymptomatic (Ministry of Health Indonesia, 2018a; CDC, 2022). Rubella poses severe risks during early pregnancy, leading to complications like miscarriage, stillbirth, and congenital rubella syndrome (CRS), which can cause disabilities such as congenital heart defects and hearing loss, especially if infection occurs in the first trimester (Terracciano et al., 2020; Motaze et al., 2021; Gudeloglu, Akillioglu and Demirdag, 2023; Levin et al., 2023; Thompson and Cochi, 2024). Prevention is crucial as no treatment exists for congenital rubella infection (Gudeloglu, Akillioglu and Demirdag, 2023).

The Global Vaccine Action Plan (GVAP) and the Global Measles and Rubella Strategic Plan led to the creation of elimination targets for measles and rubella across various regions of the World Health Organization (WHO) (Motaze et al., 2021). Measles remains a major contributor to global illness and death, especially in regions like Africa and Southeast Asia (Bester, 2016; Moss, 2017). Before the widespread implementation of vaccination programs, measles accounted for an estimated 2.6 million deaths annually. Despite extensive immunization efforts, the World Health Organization (WHO) reported approximately 134,200 measles-related deaths globally in 2015, equating to 15 deaths per hour. Since the measles vaccine's global rollout, mortality has significantly decreased, from 761,000 deaths in 2000 to 128,000 in 2021 (Kondamudi and Waymack, 2024).

Before the vaccine was available, rubella peaked for children aged 5 to 9 years old. However, as the vaccine develops, Rubella is usually only found in endemic countries. In these endemic countries, The incidence of rubella in the general population is estimated to be 1.30 cases per 100,000 individuals (Leonor and Mendez, 2023). A study indicated that the incidence of congenital rubella syndrome (CRS) cases was expected to be low in many countries, particularly smaller ones. This low prevalence is partly due to the younger average age at which rubella infection occurs, reducing the risk of infection among pregnant women and thereby limiting CRS cases. However, as the rubella vaccine becomes more widely available through the private sector, the prevalence of infection—and consequently, the incidence of CRS—is projected to increase (Levin et al., 2023).

The available measles and rubella immunizations in Indonesia are the MR (Measles Rubella) and MMR (Measles, Mumps, Rubella) vaccines, which utilize live attenuated virus. Currently, there are no inactivated vaccines available;

therefore, the rubella vaccine is not recommended for administration to pregnant women (Ministry of Health Indonesia, 2018a). Currently, in Indonesia, MR or MMR Vaccine is given three times to children at the age 9 months, 15-18 months, and 5-7 years old.

Since two years ago, we have held community services focusing on Congenital Rubella Syndrome. In 2022, we held a community service titled "Improving the Quality of Life of Children with Congenital Rubella Syndrome." In the following year, we held another community service titled "Promotional and Preventive Efforts Against Congenital Rubella Syndrome (CRS) Infection in the Imogiri II Community Health Center, Bantul, DIY," aiming to increase awareness and knowledge about CRS.

According to data from the Department of Health in Yogyakarta, the average coverage of the Measles-Rubella (MR) vaccination in the Special Region of Yogyakarta (DIY) Province in 2023 was 97.49%. The highest coverage was recorded in Kulon Progo Regency (98.59%), followed by Gunungkidul Regency (97.63%), Sleman Regency (97.50%), Bantul (97.13%), and Yogyakarta City (96.85%).

Our initiative aims to eliminate Congenital Rubella Syndrome (CRS) in the Special Region of Yogyakarta, beginning this year at the Regency level. We chose Kulon Progo and Gunungkidul Regencies as both of them have the highest MR vaccination coverage compared to other regencies as stated above, increasing the likelihood of success to eliminate CRS. As health workers from primary health centers and elementary teachers are the frontline in administering MR II Vaccination in Indonesia (Ministry of Health Indonesia, 2018b), we, therefore, conducted this study as a part of our larger community engagement program " Efforts to Eliminate Measles and Rubella to Prevent the Incidence of Congenital Rubella Syndrome (CRS) in Kulon Progo and Gunungkidul Regencies." In this study, we aim to enhance the knowledge of health workers and elementary teachers regarding measles, rubella, CRS and elimination strategies of these diseases in Kulon Progo and Gunungkidul Regency.

METHODS

Design and Setting

This study employs a quasi-experimental, non-randomized design with no control group. This study was also a part of a larger community engagement program entitled "Efforts to Eliminate Measles and Rubella to Prevent the Incidence of Congenital Rubella Syndrome (CRS) in Kulon Progo and Gunungkidul Regencies." In this community engagement program, we aim to improve advanced management of measles-rubella vaccination by health workers and elementary teachers and to improve the quality of promotive and preventive education of CRS. Our team collaborated with the Health Office of the Special Region of Yogyakarta (DIY), Gunungkidul Regency, and Kulon Progo Regency from April to September 2024 to implement these community engagement programs. As a part of our community engagement program, this study was conducted in July 2024 collaborating with the Health Office of the Special Region of Yogyakarta (DIY), Gunungkidul Regency, and Kulon Progo Regency. All primary health centers in Kulon Progo and Gunung Kidul Regencies and two schools in each regency selected by the Health Office were involved in this study.

Participants

This study engaged participants through a total sampling method as we included all participants that attended the program. All primary healthcare workers and elementary teachers were included in this study. However, participants who did not fully engage in the educational program or did not complete either the pre-

test, post-test, or both were excluded from the study. A total of 72 health workers and eight teachers participated. Data on participant characteristics were collected through a questionnaire, and all participant identities were kept confidential.

Intervention and Data Collection

This study conducted an educational program utilizing a multi-modal approach. The program was delivered once in each regency, with each program lasting approximately two hours. This program consisted of seminar conducted by experts and also printed out information of pocketbooks, display banners, and brochures that were given after the seminar. Printed out pocketbooks, display banners, and brochures were developed by the researchers, who were experts in this matter. These consisted of information on MR vaccination, measles and rubella diseases, and CRS.

Table 1. Materials given to participants

Topic	Speaker
Overview of CRS and Community Engagement Program	Pediatric Neurology Consultant
Elimination Program of Measles, Rubella, and CRS in Special Region of Yogyakarta	Health Office of Special Region of Yogyakarta (DIY).
Measles, Rubella, CRS, and MR Immunization	Pediatric Neurology Consultant

There were three sessions that were given in the seminar, as detailed in Table 1. After each material, participants were given time for question and answers session. This seminar started with the first session that was given by a pediatric neurology consultant about an overview about CRS and our community engagement program in general. In this material, participants were given information about CRS in general, the importance of preventing CRS, and also what can be done in preventing CRS and in reaching elimination of CRS, and also about our community engagement program.

The second material was given by the Health Office of Special Region of Yogyakarta (DIY). In this second material, participants were given detailed information about measles, rubella and CRS data in the Special Region of Yogyakarta (DIY) and each regency. The data consisted of number of cases, immunization coverage, and also current management programs and health policies by the Health Office regarding the elimination of measles-rubella/CRS.

The last material was given by another pediatric neurology consultant. In this last material, participants were given detailed information about measles, rubella, CRS, and MR immunization. Definition, risk factor, etiology, clinical manifestation, diagnosis, and management of measles, rubella, and CRS were discussed in this session. In addition, MR immunization guide and the importance of immunization were also discussed in this material.

This study collected data from a paper-based pre-test and post-test questionnaire. The questionnaire consisted of 20 Yes-No questions, as stated in Table 2. It was designed and validated by a pediatric neurology consultant to assess the knowledge of participants on measles, rubella, CRS, and their prevention.

Table 2. Pre-test and Post-test Questionnaire

No	Question	Yes	No
1	Do you know about the cause of Measles and Rubella?	○	○
2	Do you know how Measles is transmitted?	○	○

No	Question	Yes	No
3	Do you know how Rubella is transmitted?	○	○
4	Can Measles and Rubella cause harmful effects on patients?	○	○
5	Can Measles and Rubella be prevented?	○	○
6	Can Measles and Rubella be prevented through vaccination?	○	○
7	What is the cause of Congenital Rubella Syndrome?	○	○
8	Do you know how Congenital Rubella Syndrome is transmitted?	○	○
9	Do you know how Congenital Rubella Syndrome can be prevented?	○	○
10	Can Congenital Rubella Syndrome affect the brain?	○	○
11	Can Congenital Rubella Syndrome affect the eyes?	○	○
12	Can Congenital Rubella Syndrome affect the ears?	○	○
13	Can Congenital Rubella Syndrome affect the heart?	○	○
14	Can Congenital Rubella Syndrome affect the growth and development of children?	○	○
15	Are you aware of the measles-rubella elimination program in the Special Region of Yogyakarta (DIY)?	○	○
16	Do you know which programs are included in the efforts to eliminate measles-rubella in the Special Region of Yogyakarta?	○	○
17	Is achieving and maintaining high population immunity by achieving and maintaining immunization coverage an effort to eliminate measles-rubella	○	○
18	Is achieving and maintaining case-based measles-rubella surveillance (Case-Based Measles Surveillance/CBMS) an effort to eliminate measles-rubella?	○	○
19	Is strengthening and expanding the network of accredited measles-rubella laboratories across the provinces in Indonesia an effort to eliminate measles-rubella?	○	○
20	Is strengthening support and cooperation between related programs and sectors an effort to eliminate measles-rubella?	○	○

Data Analysis

The pre-test and post-test was scored by assigning a value of 1 to correct answers and 0 to incorrect answers. There was no deduction for incorrect answers. The total value of score was then determined as knowledge of participants. Data analysis was conducted using SPSS version 29 (IBM Corp, Armonk, NY, USA). Wilcoxon signed-rank test was used to compare knowledge scores between health worker and elementary school teacher groups. Demographics of characteristics of the participants, including age, gender, occupation, and education was analyzed descriptively. The variable in this study consisted of knowledge of participants as dependent variable and multi-modal education program as independent variable.

Ethics

This study was conducted as a part of a larger community engagement program and adhered to established medical ethics standards. It received approval from the Institutional Review Board of the Faculty of Medicine, Public Health, and Nursing at Universitas Gadjah Mada (Ref. No. Ethical Clearance: KE/FK/1037/EC/2024).

RESULT

Table 3. Characteristic of subjects

Characteristic		**Value (n=80)**
Age (years)		43,475 ± 8,39
Gender	Female	67
	Male	13
Occupation	Administrative	24
	Dentist	1
	Doctor	17
	Epidemiologist	7
	Midwife	12
	Nurse	8
	Pharmacist	1
	Pharmacist Assistant	2
	Teacher	8
Education		
	High School Graduate	1
	Diploma 3 (D3)	17
	Diploma 4 (D4	1
	Bachelor (S1)	49
	Master (S2)	12

In this program, we conducted a seminar that included socialization and education about measles-rubella elimination for health workers and representatives of elementary schools. We compared the participants' knowledge levels before and after the seminar to assess and evaluate the program's efficacy. In the Kulon Progo Regency, 47 people participated. Of the total participants, five participants were excluded because they did not complete the survey. In the seminar held at Gunungkidul, 40 participants attended, out of which two participants were excluded because they still needed to complete the survey data. Characteristics of the health workers who became participants are available in Table 3**.** The study's response rate for health workers and elementary schoolteachers' data was 92.3% and 88.9%, respectively.

Table 4. Knowledge comparison using the Wilcoxon signed-rank test in health workers group

	Mean	**Standard Deviation**	**p**	**z**	**r (effect size)**
Pre-test	18.39	1.48	<0.001	-5.646	0.665
Post-test	19.78	0.56			

The mean knowledge score of health workers (Table 4) before the intervention was 18.39, with a standard deviation of 1.48. Following the

intervention, the mean score increased to 19.78, with a standard deviation 0.56. A p-value of less than 0.001 was observed, meaning this improvement was statistically significant, and the z-score was negative (-5.646). The effect size, calculated at 0.665, suggests a substantial impact. The confidence interval for the difference between pre-test and post-test scores, with 95% certainty, ranges from -1.732 to -1.044. If we compare, before the intervention, elementary school teachers' mean knowledge score (Table 5) was 18.13, with a standard deviation of 2.23. The mean score rose to 20.00 with a standard deviation of 0.00 after the intervention. The z-score was negative (-1.841), and a p-value greater than 0.05 indicated that this improvement was not statistically significant. A significant impact is suggested by the effect size, which was determined to be 0.651. With 95% confidence, the confidence interval range for the difference between the pre-test and post-test scores is -3.741 to -0.009.

Table 5. Knowledge comparison using the Wilcoxon signed-rank test in elementary school teachers group

	Mean	**Standard Deviation**	**p**	**z**	**r (effect size)**
Pre-test	18.13	2.23	0.066	-1.841	0.651
Post-test	20.00	0.00			

DISCUSSION

This study was conducted primarily to improve the outcomes of the CRS program. As a preliminary step toward integrating the two programs, it sought to improve health professionals' and elementary teachers' knowledge about measles and rubella disease, MR vaccination, and CRS. Additionally, this study was conducted as a continuation of our previous research, which found that in Yogyakarta the prevalence of CRS in neonates is significant (Herini et al., 2018). Consequently, the number of congenital rubella syndrome (CRS) cases has declined one year following the MR vaccination campaign in Yogyakarta. Additionally, the establishment of an effective surveillance system can help track the incidence of CRS cases (Herini et al., 2021).

According to the School Immunization Guidelines, MR vaccination is given to elementary school students, and it should be carried out according to schedule and cannot be postponed. School teachers are involved in the immunization process. They are expected to know the schedule for BIAS (Immunization for School-Aged Children) services and the advantages of the vaccine (Ministry of Health Indonesia, 2018b). Additionally, school-based vaccinations are beneficial because they eliminate the need for parents to take time off work for hospital visits. At the same time, students receive valuable emotional support from their teachers and peers (Krishnendhu and George, 2022). However, there have been several obstacles to overcome in implementing mass vaccination programs, whether community- or school-based. These obstacles include a need for more awareness of the necessity, concern about side effects, and government motivation (Pai et al., 2022). Therefore, both health workers and school teachers are important in improving the prevention of Congenital Rubella Syndrome.

As public health evolves, the WHO states that accessing legitimate information at the right time can be critical (World Health Organization, 2020). Our community program deployed a multi-

modal method to increase health workers' and teachers' knowledge by conducting a seminar with two lectures from experts and handing out pocketbooks, display banners, and brochures related to MR vaccination, measles and rubella diseases, and CRS. This program aligns with a study that stated the multi-modal approach had a higher learning outcome than the conventional or one-method approach (Firmansyah, 2021).

Our study found that after two lectures conducted by our experts on measles, rubella, the CRS and MR vaccination programs, and printed infographics, there was a statistically significant increase in knowledge among health workers regarding these topics. In the questionnaire responses, health workers reported an increased understanding of rubella transmission, the impact of CRS on hearing loss, and the details of the measles-rubella elimination program, particularly in the Special Region of Yogyakarta, after participating in our community service program.

According to a study by Decorby-Watson et al. (2018), capacity-building interventions can improve knowledge, skills, self-efficacy (including confidence), practice or policy changes, behavioral modifications, application, and system-level capacity. The study also highlights the importance of enhancing health workers' knowledge in the context of various public health interventions (Decorby-Watson et al., 2018). Another study by Maude et al. (2021) stated that health workers who received targeted educational interventions had significantly improved practices related to infection prevention. These reflect our program's success in enhancing health workers' knowledge and practices, which is essential for the successful elimination of measles and rubella in our targeted regions.

On the other hand, elementary teachers show improvements in their understanding even though it is not statistically significant most likely due to the small number of teachers participating in the program. But it could also be caused by elementary teacher lack of knowledge about vaccinations, especially vaccination programs for their children. A study from Pelullo et al. (2022) revealed that there was only a small number of schoolteachers who had good knowledge of recommended vaccinations. Meanwhile, teachers play a crucial role in addressing vaccine hesitancy among students and parents, which is closely tied to their own knowledge, attitudes, and practices regarding vaccines (Gkentzi et al., 2021). These findings highlight the need for targeted educational strategies to ensure that schoolteachers are better informed about vaccination programs that are administered in schools (Pelullo et al., 2022).

Several limitations should be acknowledged in this study. First, the sample size for elementary teachers was small, limiting the statistical power to detect meaningful differences in knowledge improvement. Second, the intervention was conducted over a relatively short period, which may not have allowed for the retention or application of knowledge in practice. Additionally, this study was conducted in two specific regencies, Kulon Progo and Gunungkidul, which limits the generalizability of the findings to other regions with different socioeconomic or cultural contexts.

However, the success of health worker education in this campaign is a positive step toward achieving rubella and CRS elimination targets in the Special Region of Yogyakarta. Our findings suggest that public health authorities should prioritize continuous and accessible education programs for health workers and school teachers to sustain improvements in knowledge. Teacher training should be integrated into the broader public health agenda, given teachers' role in school-based vaccination programs. Policymakers could consider mandating vaccination-related training as part of teacher certification or professional development

programs. Furthermore, strengthening partnerships between health departments and schools is crucial to improving vaccination coverage and addressing vaccine hesitancy.

Future studies should include larger and more diverse participant groups to ensure a broader understanding of the knowledge gaps in different sectors. Long-term studies should also be conducted to assess the sustainability of knowledge improvements over time. Additionally, research focusing on the logistical and cultural challenges in vaccination efforts, particularly in rural or underserved communities, would provide valuable insights into optimizing public health campaigns.

CONCLUSION

In conclusion, this study found an enhanced knowledge among health workers concerning measles, rubella, CRS, and elimination strategies after the interventions. In addition, the elementary teachers group showed enhanced knowledge, but not statistically significant most likely due to the small number of participants. However, it is essential that public health authorities should prioritize continuous and accessible education programs for health workers and school teachers to sustain improvements in knowledge regarding measles, rubella, CRS and its eradication methods.

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