Enhancing Pediatric TB Treatment Compliance: Marketing Strategies for Medication Reminder Devices

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Article Info	ABSTRACT
	This research focuses on developing a marketing strategy for a medication reminder device (Alarm Obat) to improve medication adherence among children with tuberculosis (TB) in Indonesia. Tuberculosis remains a significant public health challenge, especially in pediatric populations, where adherence to long-term treatment regimens is critical for successful outcomes. The study explores how Alarm Obat, a device designed to remind children to take their medication on time, can help increase adherence and reduce treatment failures. The research also highlights the potential for this product to be integrated into healthcare programs, focusing on partnerships with healthcare institutions and digital marketing strategies. By targeting families with children suffering from TB, the research aims to demonstrate the impact of Alarm Obat on improving health outcomes and reducing the risk of drug resistance. The study concludes by emphasizing the importance of awareness campaigns and collaborative efforts to ensure accessibility and adoption of the product across diverse communities in Indonesia.

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1. INTRODUCTION

Tuberculosis (TB) remains one of the leading causes of morbidity and mortality [1], especially in Indonesia with the country ranking among the highest in TB burden globally [2]. Particularly in children, the treatment of TB is challenging due to the long duration of therapy and the necessity for strict adherence to medication schedules. Failure to adhere to prescribed treatment regimens often results in treatment failure, drug resistance, and the further spread of TB [3], [4]. This issue is compounded by the difficulty many children face in following medication schedules due to a lack of awareness of the disease's seriousness and the complexities involved in daily treatment routines [5].

The low adherence to TB treatment in children is a significant barrier to successful outcomes, with many children failing to take their medication on time, either due to forgetfulness or discomfort with the treatment process [6]. This non-compliance can also stem from a lack of consistent supervision from parents, who may be unaware of the severity of TB or unable to manage the medication schedule consistently. According to a study, the involvement of caregivers is critical in ensuring that children adhere to their TB treatment plans [7]. However, without technological support, maintaining adherence remains a significant challenge.

Recent technological innovations, particularly medication reminder devices [8], have been identified as a potential solution to enhance adherence to TB treatment [9], especially in children. One such innovation is the "Alarm Obat," a device designed to alert children and their caregivers when it is time to take medication. This device uses multisensory reminders, such as sound, vibration, and visual cues, to ensure that children do not miss their medication. Various studies have explored such devices' effectiveness, promising results in improving medication adherence in chronic diseases [10], [11]. However, the successful implementation and widespread adoption of such devices require effective marketing strategies and public awareness campaigns, which remain underexplored in the context of pediatric TB treatment.

This study aims to develop a comprehensive marketing strategy for the Alarm Obat device, specifically targeting families with children suffering from TB in Indonesia. The research will explore the feasibility of integrating this product into existing TB treatment programs and assess its potential impact on improving medication adherence. The

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study will also examine the role of healthcare institutions in promoting the use of Alarm Obat and how digital platforms can enhance product outreach to families.

Previous research has highlighted the critical role of innovative health technologies in improving the management of pediatric diseases, including TB [12], [13]. A recent study emphasized the potential for mobile health technologies to support medication adherence in pediatric TB patients [14], [15]. Furthermore, Carter and Wilson (2018) noted that integrating digital health tools, such as medication reminder systems, could significantly enhance patient compliance [16], [17]. Technology and traditional healthcare methods are seen as promising avenues for tackling TB treatment adherence challenges. However, to effectively implement such technologies in Indonesia, it is essential to explore the local market dynamics and devise tailored strategies that consider the country's unique cultural and healthcare context. Despite the promise of digital adherence tools, their adoption and integration into healthcare practices remain limited, particularly in countries with high TB burdens, like Indonesia.

Recent advances in health technology have introduced various digital tools designed to improve medication adherence, especially among pediatric patients with chronic diseases such as tuberculosis (TB). One such innovation is medication reminder systems, including alarm devices, which have shown promising results in supporting patients in adhering to their prescribed treatment regimens. Several studies, such as those by Carter and Wilson (2018) and Kim and Lee (2018), have demonstrated the effectiveness of digital interventions in managing chronic illnesses by providing timely reminders and enhancing patient engagement. Additionally, mobile health technologies, like medication tracking apps and digital alarms, have gained attention for their potential to bridge the gap in care for children who require strict and prolonged medication schedules, such as pediatric TB.

Previous research on digital adherence devices has predominantly focused on adult populations or other chronic conditions, with fewer studies exploring pediatric TB patients' specific needs and challenges. Furthermore, there is a lack of comprehensive studies assessing the effectiveness of combining medication reminder systems with targeted marketing strategies to ensure broad adoption and successful integration into TB treatment programs. This gap in the literature highlights the need for a tailored marketing approach that not only promotes the technical benefits of such devices but also addresses cultural, economic, and educational barriers to their use. These studies underscore the potential of digital interventions, such as the Alarm Obat device, in improving medication adherence and treatment outcomes for children with TB.

2. RESEARCH METHOD

This research follows a structured approach consisting of several stages, each aimed at assessing the effectiveness of the Alarm Obat medication reminder device in improving medication adherence among pediatric TB patients in Indonesia. The study employs qualitative and quantitative methods, from developing the product to evaluating and implementing its marketing strategy.

The first stage involves product development, where the Alarm Obat device is designed to meet the needs of children with TB. This includes creating a user-friendly, attractive device for children that can provide multisensory reminders (such as sound, vibration, and visual cues) to ensure adherence to medication schedules. The Theory of Planned Behavior (Ajzen, 1991) supports this stage, as it emphasizes that behavior is influenced by attitudes, subjective norms, and perceived behavioral control, all of which can be affected by the design and usability of the device.

In the second stage, the study moves to the testing and validation phase, where a pilot group of 50 children diagnosed with TB and their families will use the device for six months. During this time, the Health Belief Model (Rosenstock, 1974) will be applied to evaluate how perceived susceptibility, severity, benefits, and barriers influence the families' adoption of the device. This model helps understand the decision-making process of caregivers and parents in the context of health interventions, highlighting the role of perceived risks and benefits in adopting a medication adherence tool.

The third stage focuses on data collection through surveys and interviews with the children's families and healthcare providers. This mixed-methods approach will allow for a comprehensive understanding of the device's impact on adherence and its acceptance by the target population. Social Cognitive Theory (Bandura, 1986) underpins this stage, as it posits that learning occurs in a social context, and individuals are more likely to engage in behaviors (such as medication adherence) when supported by others (e.g., parents, healthcare providers).

The final stage involves evaluating the marketing strategy, which will be assessed based on its reach, effectiveness, and acceptance among the target audience. The strategy will include digital campaigns, partnerships with healthcare institutions, and awareness programs in local communities. The Diffusion of Innovations Theory (Rogers, 2003) will guide the evaluation, as it explains how, why, and at what rate new ideas and technology spread, helping to identify the key factors that influence the adoption of the Alarm Obat device in different social and cultural contexts.

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Each of these stages is essential for ensuring the Alarm Obat device's practical applicability and success, not only as a technological tool but also as a culturally relevant solution to improving pediatric TB treatment outcomes in Indonesia. The combination of innovative product development and strategic marketing ensures the intervention is effective and widely accepted.

3. RESULTS AND DISCUSSION

3.1. Result

a. Community Acceptance

Patients' families were well-received by the drug alarm product. Most parents found it easier to ensure their children took their medication on time. Children also seemed more responsive to reminders from the alarm, and they no longer forgot to take their medication.

b. Effectiveness of Increasing Compliance

The evaluation results showed a significant increase in the compliance of children with pulmonary TB in taking their medication. Before using the alarm, many children often missed their medication schedule, but after using the alarm, almost all children were able to take their medication according to the schedule.

c. Feedback from Families and Health Workers

Patient families provided positive feedback regarding the ease of use of the alarm and its benefits in helping them monitor their children's treatment. Health workers also acknowledged that the drug alarm helped them provide better care to young patients.

d. Financial Details

Table 1. Financial Detail

Component	Details	Cost (IDR)
Drug Alarm Development	Cost of materials and product assembly	3.500.000
Marketing & Socialization	Making brochures, social media	1.500.000
Product Distribution	Cost of distributing alarms to health centers	500.000
Evaluation and Monitoring	Cost of data collection and survey	500.000
Total Cost		6.000.000

Pulmonary tuberculosis (TB) in children is one of the pressing health problems in Indonesia and around the world. Children, especially those under 5 years of age, are more susceptible to TB infection and often face difficulties in following long-term treatment. One of the main obstacles in treating TB in children is compliance in taking medication, which is very important to ensure that treatment goes well and avoid further complications such as drug resistance. Compliance in taking medication in children is often difficult to achieve, especially because children may not understand the importance of treatment or are not comfortable with treatment that must be taken for a long time. In this context, a medication alarm can be an effective solution to help children remember when to take their medication. Medication alarms can improve medication compliance, reduce the possibility of late or missed treatment, and support the success of TB therapy in children.

3.2. Discussion

Pulmonary tuberculosis (TB) in children is one of the pressing health problems in Indonesia and around the world [18]. Children, especially those under 5 years of age, are more susceptible to TB infection and often face difficulties in following long-term treatment [19], [20]. One of the main obstacles in treating TB in children is compliance in taking medication, which is very important to ensure that treatment goes well and avoid further complications such as drug resistance.

Compliance in taking medication in children is often difficult to achieve, especially because children may not understand the importance of treatment or are not comfortable with treatment that must be carried out for a long time [21]. In this context, a drug alarm can be an effective solution to help children remember when to take their medication. Drug alarms can improve treatment compliance, reduce the possibility of late or missed treatment, and support the success of TB therapy in children [22], [23].

The problem of treatment compliance in children with pulmonary TB has become a significant challenge in the world of health. The process of treating TB in children requires a long time (6 months or more) and regular doses of

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drugs, which children or their parents often forget [24] because children generally do not understand the importance of long-term medication, so they do not feel the need to take medication regularly, children can get bored with the routine medication schedule and may find it an unpleasant activity, and parents are often busy with work and other activities, so they cannot always remind their children to take their medication on time [25], [26].

Adherence to medication is crucial to prevent drug resistance, which can complicate TB treatment in the future [11]. Therefore, creating a solution that can help children remember when to take their medication is a crucial step. A medication alarm is an electronic or digital device designed to remind patients (in this case, children) to take their medication at the specified time [27]. This medication alarm works by providing an attractive sound or visualization for children to attract their attention at the right time to take their medication. The importance of a medication alarm in this context is to create a more effective and enjoyable reminder [28], [29]. By using a medication alarm, children will be more familiar with the medication routine, and they can learn to adhere to their medication schedule without feeling burdened [30]. Alarms that sound or have bright visual indicators can attract the attention of children, who are usually more responsive to attractive stimuli.

Medication alarms designed for children should take into account their psychological and cognitive characteristics tend to be more attracted to cheerful or pleasant sounds than to regular alarm sounds that can be distracting. With child-friendly sounds, the medicine alarm can attract children's attention without scaring them. The design of the medicine alarm with bright colors and cute shapes will make it more attractive to children. For example, the alarm is shaped like a cartoon character or animal that children like. Parents can set this alarm to sound at the right time according to the medication schedule determined by the doctor. This automatic reminder helps children to independently follow the schedule without having to rely on reminders from parents. In addition to sound, the medicine alarm can also be equipped with visual indicators such as flashing lights, which will give children a sign that it is time to take medicine. The application of medicine alarms can have a significant impact on children's compliance with taking medicine. Medicine alarms not only function as reminders, but also teach children to be more disciplined and responsible for their health. With regular use of medicine alarms, children will better understand the importance of treatment and tend to be more cooperative in following medical instructions. In addition, higher compliance in treatment also reduces the risk of drug resistance or transmission of TB to other family members. If children comply with treatment properly, the chances of recovering from pulmonary TB will be higher, and this reduces the possibility of further complications.

Drug alarm marketing not only aims to introduce this product to families of TB patients, but also to increase public awareness of the importance of compliance in TB treatment in children. The drug alarm marketing program involves several strategic steps, including: medical personnel, such as doctors and nurses, play an important role in educating parents about the benefits of using drug alarms, Campaigns involving health centers or hospitals are significant in increasing public acceptance, Introduction of drug alarms is carried out through brochures, seminars, and direct education to patient families. This allows parents to know how to use drug alarms and why it is important to support children's compliance in treatment, and drug alarms can be distributed through health centers or hospitals that treat children with pulmonary TB. This distribution makes it easier for patient families to access products that can help them monitor their child's treatment.

Although drug alarms offer many benefits, there are some challenges to marketing these products. Some families may have difficulty accessing these drug alarm products, especially if they live in remote areas or do not have easy access to health facilities or stores that sell the products. The community may not be fully aware of the importance of TB treatment adherence in children, so they may feel that drug alarms are not necessary. Therefore, it is important to continue to raise awareness through educational campaigns. The cost of developing and distributing affordable drug alarms for low-income families can be a challenge. Finding funding or sponsors to help with these costs would be very helpful. With drug alarms, parents do not have to worry about constantly reminding their children to take their medication. This gives them more time to focus on other aspects of their child's care. Drug alarms can reduce the chances of children missing medication appointments, which in turn reduces the risk of treatment failure and further complications. By ensuring that children take their medication regularly, drug alarms contribute to reducing the transmission of TB to other family members. Mobile applications to monitor medication schedules more sophisticatedly. Integration with hospital or health center systems for further monitoring by medical personnel. Development of more interactive audio-visual features to increase child involvement in their treatment.

4. CONCLUSION

Drug alarm marketing for children with pulmonary TB has proven to be an effective, innovative solution in improving treatment adherence. Pulmonary TB in children is a serious health problem, and one of the biggest challenges is ensuring that children adhere to the required long-term treatment. Non-adherence to treatment can lead

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to treatment failure, drug resistance, and increased risk of transmitting the disease to other family members. Drug alarms specifically designed for children provide significant benefits in supporting medication adherence. With attractive designs and automatic reminders, drug alarms help children adhere to their medication schedules without feeling burdened. The pleasant sound features and visual indicators, such as flashing lights, make drug alarms a practical and fun tool for children, which in turn reduces the stress and boredom that often occurs in long-term TB treatment. Drug alarm marketing programs have also proven to be successful in raising awareness among parents and healthcare professionals about the importance of timely TB treatment. Through proper marketing, families of patients can easily access these products, which not only help children remember when to take their medication but also help parents ensure that their children adhere to their medication schedules more consistently.

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