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Health System Challenges in Managing Schistosomiasis Among Pregnant Women: A Qualitative Study from an Endemic Indonesian Highland

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ABSTRACT

Introduction: Schistosomiasis infection in pregnant women can lead to poor newborn health and reduced birth weight. The present study was conducted on an endemic area, while the risk of pregnant women being exposed to Schistosomiasis in the Napu Highlands is quite high. This study aims to describe the health care system related to Schistosomiasis in pregnant women within the Puskesmas Wuasa working area.
Method: This study used a qualitative descriptive approach in the Puskesmas Wuasa working area in Poso Regency. The sample consisted of 11 key informants, including four pregnant women, three health workers, two Schistosomiasis laboratory workers, one head of the Puskesmas, and one official from a related agency. Data were collected through guided interviews.
Results: Mass screening for Schistosomiasis occurs annually, but specific screening for pregnant women has not been implemented, despite their support for it. Pregnant women cannot take Praziquantel due to potential fetal risks and regulatory concerns. Positive tests lead to referrals by village midwives to Puskesmas. Additionally, Schistosomiasis insurance for pregnant women is readily accessible, often covered by government insurance, ensuring support for affected individuals.
Conclusion: Current health services inadequately support pregnant women in Schistosomiasis -endemic areas, particularly in the Puskesmas Wuasa. The present study highlights the implementation gap in integrating schistosomiasis screening and treatment into antenatal care services within a specific endemic area. Ensuring the safety and regulation of praziquantel as the primary treatment is essential to optimize health services for this vulnerable group.

Keywords: Delivery of health care, mass screening, praziquantel, pregnancy, schistosomiasis

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Introduction

Schistosomiasis is a parasitic disease caused by trematode worms belonging to the genus Schistosoma, which can present as acute or chronic conditions. In 2016, it was estimated that over 206.4 million individuals required treatment and preventive measures.[1] Among women of reproductive age, approximately 40 million are affected by Schistosoma infections, yet the morbidity associated with pregnancy remains inadequately studied. Notably, around 10 million women in Africa were infected with schistosomiasis during pregnancy each year. The disease results in significant nutritional, hematological, and cognitive impairments, leading to considerable morbidity and mortality in the general population. Although research on the effects of schistosomiasis during pregnancy is limited, existing case reports suggest associations with adverse neonatal outcomes and reduced birth weight.[2]

Schistosomiasis in Indonesia is predominantly observed in the Central Sulawesi Province, particularly within the Napu and Bada highlands of Poso Regency and the Lindu highlands in Sigi Regency.[3] The Bada Valley was recognized as an endemic zone for schistosomiasis in 2008.[4] Between 2011 and 2015, the reported prevalence of schistosomiasis among humans in the Napu Highlands was 0.31%, 1.43%, 2.25%, 0.8%, and 1.9%, respectively. This disease is caused by the trematode worm Schistosoma japonicum, with the Oncomelania hupensis lindoensis snail serving as its intermediate host. Schistosomiasis affects not only humans but also a wide range of mammals, both domestic and wild, which significantly contributes to the persistence of high reinfection rates.[5]

The Napu Plateau, recognized as an endemic region, presents a heightened risk of schistosomiasis exposure for pregnant women. In this setting, a woman's health prior to pregnancy plays a crucial role in influencing both pregnancy outcomes and infant health. Factors such as inadequate nutrition, resilient place attachment, and elevated rates of infectious diseases significantly contribute to maternal and infant mortality, as well as low birth weight (LBW), particularly in less developed nations. Pregnant women with low birth weight, short stature, anemia, or existing infections are at an increased risk of delivering infants with low birth weight.[2]

Integrated healthcare plays a crucial role in managing schistosomiasis infections.[6] Over the past 60 years, China has made significant strides in controlling schistosomiasis, closely linked to the healthcare system's capacity to foster a conducive environment for disease management. This introduction delineates three key phases in the control of schistosomiasis: an initial disease elimination strategy focused on snail control (1950s to early 1980s); a shift toward a chemotherapy-based morbidity control strategy (mid-1980s to 2003); and the

introduction of an integrated control strategy (2004). Each phase emerged under different policy-making conditions. We will analyze these phases to identify five critical issues in disease control within the context of the healthcare system and its recent developments. These issues encompass the policy-making process, cross-sectoral health initiatives, equity and access to healthcare, funding for essential resources, and the enhancement of resource management and planning. Together, these factors inform an agenda aimed at integrating research and capacity-building efforts within China's healthcare framework, ultimately enhancing the environment for effective schistosomiasis control.[7] Therefore, this study aims to assess whether the existing health service system related to Schistosomiasis is sufficient to cover pregnant women in terms of treatment and prevention of Schistosoma worm infections in the Puskesmas Wuasa working area, including diagnosis systems, treatment systems, referral systems, and insurance systems.

Methods

This study uses a qualitative descriptive approach that aims to obtain in-depth information regarding the facts of the health service system, including the diagnosis system, treatment system, referral system and insurance system related to Schistosomiasis in pregnant women in the working area of Puskesmas Wuasa, North Lore District, Poso Regency, Central Sulawesi Province from March to April 2025. The qualitative method was selected due to the limited existing research on pregnant women. This approach enables an in-depth examination of the challenges encountered at the research site. This research protocol has been reviewed and approved by the Health Research Ethics Committee of the Faculty of Medicine, Hasanuddin University, Makassar, on April 9, 2025 (Protocol No. UH19020064).

Informants for this study were selected through purposive sampling based on specific inclusion criteria. Eligible participants included individuals residing within the Puskesmas Wuasa's service area, pregnant individuals, health workers affiliated with the Puskesmas, and the Schistosomiasis Laboratory in Wuasa, as well as those possessing comprehensive knowledge of schistosomiasis. Additional criteria included prior consumption of praziquantel, physical and psychological health, effective communication skills, and a willingness to participate in the study. Participants who were absent during the study period or had recently moved to Wuasa without previous involvement in mass schistosomiasis screening and treatment were excluded from the study. Therefore, the informants of the present study consisted of four pregnant women, three health workers from the Puskesmas Wuasa, two officers from the Schistosomiasis Laboratory, one Head of the Puskesmas, and one decision-

maker from the relevant agency.

Primary data for this study were gathered through guided interviews. Additionally, secondary data were obtained via direct field observations and document analysis, which included Puskesmas annual reports, Health Research Bulletins, medical records, and other relevant materials concerning the research subject. The analyzed data are presented in a descriptive and qualitative matrix format, complemented by explanations that adhere to established guidelines and standards.

Result

Table 1 shows the baseline characteristics of the informants. All informants had a varied age range, ranging from 28 to 62 years. All the pregnant women informants worked as housewives, with the majority having a high school education. Midwives and nurses constituted most of the health workers in this study.

Table 1. Characteristics of health service system informants related to Schistosomiasis in Puskesmas Wuasa working area

No.	Initial	Age (years)	Gender	Working Status	Education Level
1.	Informant Y	28	Woman	Housewife	Senior high school
2.	Informant S	36	Woman	Housewife	Junior high school
3.	Informant S	35	Woman	Housewife	Senior high school
4.	Informant N	30	Woman	Housewife	Senior high school
5.	Informant R	32	Woman	Midwife	Diploma-3
6.	Informant V	29	Woman	Midwife	Diploma-3
7.	Informant O	30	Man	Nurse	Diploma-3
8.	Informant P	39	Man	Schistosomiasis laboratory personnel	Diploma-3
9.	Informant K	62	Man	Schistosomiasis laboratory personnel	Senior high school
10.	Informant E	30	Woman	Deputy head of Puskesmas Wuasa	Bachelor
11.	Informant R	42	Man	Filariasis and schistomiasis program management staff of the Central Sulawesi Provincial Health Office	Bachelor

To describe the environmental conditions, this study presents indicators such as the Percentage of Healthy Homes, the Percentage of Healthy Public Places, and the percentage of clean and healthy living behavior (perilaku hidup bersih dan sehat, PHBS). According to the 2017 report by the environmental health officer, the percentage of healthy homes was 86.54%. This figure has reached the Healthy Indonesia target. The results of the 2017 data validation show that households in the Puskesmas working area used clean water from pipes (100%), dug wells (0%), hand pump wells (0%), rainwater reservoirs (0%), bottled water (0%), and others (0%). Wuasa Village had a PHBS percentage of of 67%, relatively higher compared to other villages in the same sub-district. Then, there were three Posbindu buildings, without any other Community-based Health Effort (upaya kesehatan berbasis masyarakat, UKBM) buildings.

Schistosomiasis screening and diagnosis system in pregnant women

Multiple diagnostic methods are available for detecting schistosomiasis, with the Kato-Katz test being a prominent example that utilizes stool samples. Annually, Schistosomiasis Laboratory personnel, in partnership with Schistosomiasis cadres, conduct a mass stool collection program. This testing method is still employed today due to its accuracy, cost-effectiveness, and ease of use.

According to the findings from interviews with informants, there were no objections to the approach of assessing schistosomiasis through mass fecal sample collection.

> *"No, it's not bothersome. We're already used to filling the pot (stool sample for examination) for sisto (Schistosomiasis)." (Informant S)*

In a survey of pregnant women regarding schistosomiasis screening, it was indicated that they had not undergone any specific test for schistosomiasis apart from the annual mass screening. One participant, identified as S, expressed concern that she had not witnessed any follow-up actions related to her stool collection results.

> *"No, there hasn't been (any Schistosomiasis screening during pregnancy). But I don't know for sure because I've never been checked—since when we're pregnant, we can't take the medication anyway. Even if they took stool samples during pregnancy, no, there's no action taken because they assume that even if we're positive (for Schistosomiasis), we can't take the medicine. If you ask if I'm afraid, yes, of course I'm afraid of getting (Schistosomiasis). But every time there's a stool sample collection, I participate. Whether I'm positive or not, I still (take part)." (Informant S)*

On another occasion, an interview conducted with Informant Y stated the same thing regarding the absence of Schistosomiasis screening for pregnant women.

> *"During pregnancy, I never received any examinations outside of mass drug*

administration, but before pregnancy, I did participate in mass socialization programs."(Informant Y)

Informant E, who is a representative of the Head of Wuasa Health Center, gave a statement regarding Schistosomiasis screening for pregnant women.

"We currently don't have a specific Schistosomiasis screening program for pregnant women. However, we conduct health education campaigns in villages about Schistosomiasis, and now there's also the GEMA BERAKSI program directly implemented by the Poso District Health Office. During every Posyandu (integrated health service post) activity, we always provide health education since it involves toddlers, pregnant women, elderly, PTN posts, Posbindu - we conduct comprehensive education through our program teams, and we always include information about Schistosomiasis. Some community members might miss the Schistosomiasis education because they don't attend village activities. Maybe they're pregnant but reluctant to come to Posyandu. We always remind the midwives - that's why we encourage midwives to regularly visit pregnant women, so they can identify any potential cases or health issues among pregnant women." (Informant E)

In 2014, a confirmed case of schistosomiasis was reported in a pregnant woman from Lanciran village, as revealed by an interview with a village midwife. The midwife noted that she became aware of the positive diagnosis after receiving the results of a community-wide stool test.

"At either 6 months or 3 months (of pregnancy), when her stool was examined, it came back positive. That area (Lanciran) is indeed a focus region. She had already been tested during the mass screening, so she was reported as positive. But they (the examiners) didn't know she was pregnant. Later when I reviewed the list of positive cases - oh my goodness, this was one of my pregnant patients! So, I had to report it again to the (Schistosomiasis Laboratory)." (Informant R)

The statement regarding the announcement of the results of this mass examination showed quite similar results based on the results of interviews conducted with informants.

"They always announce who's positive, right? Every stool examination shows the results, after all. They definitely read out the names of those who test positive. Whether it's another examination or another sample collection... I just hope my name isn't called." (Informant S)

"The treatment results aren't publicly announced because community members would typically feel ashamed. Usually only the health workers, volunteers, and their family

members are informed. So only those who test positive are notified." (Informant E)

Regarding the case found in 2014, Informant E stated that it was important to conduct Schistosomiasis screening for pregnant women.

"Early detection of schistosomiasis in pregnant women is absolutely necessary, so we can determine whether a woman is truly pregnant or if she has schistosomiasis—or both. For the development of a specialized program, even if we only identify one or two cases moving forward, we will still propose the program. Who knows? There might be more undetected cases beyond what we've found. Maybe there are others, and we've only happened to catch one. That's why we're submitting this proposal—to prevent similar incidents from recurring. We shouldn't have to wait for multiple cases; even if one is enough to warrant action. Detection must start from the beginning." (Informant E)

Furthermore, Informant S also provided feedback regarding Schistosomiasis screening for pregnant women.

"Personally, I would want and agree to have special screening (for Schistosomiasis in pregnant women). For myself, I would really like that. Ideally, I wish we could still take medication even during pregnancy. Because we also want to stay healthy, right? But of course, we just follow the regulations set by the (government) authorities above us." (Informant S)

Schistosomiasis treatment system in pregnant women

The schistosomiasis control and eradication program in the Puskesmas Wuasa area includes an annual mass treatment initiative established by the government. Previously, this initiative was conducted biannually, with sessions from January to June and from July to December. However, since 2024, the frequency has been adjusted to once a year, reflecting the increased number of government initiatives aimed at schistosomiasis management.

"During mass drug administration, the community gathers at one location. For larger villages, since 2024, it's been conducted over two days. Take Wuasa for example - previously divided into 5 stations. Doctors monitored it, and everyone came. In 2024, for instance, they would come to take the (snail fever) medication at 9 AM, with a 4-6 hour interval. They'd return at 3 PM for another dose. For the 2024 Alitupu treatment, I personally monitored the positive cases together with the Puskesmas head - 7 people in total. However, during that mass treatment, they failed the regimen. They only took one dose. When taking the second dose, they vomited. It seems that's why it failed. Now this treatment needs repeating. After stool examination (if still positive), we wait there.

The schistosomiasis volunteers wait at their homes. Then we'll check these names again later to see if they're still positive or not. It will be evaluated this year after the stool examination in May. So they take the medication first, then collect stool samples." (Informant P)

The treatment patterns also varied according to the confession of informant P. Treatment was carried out based on the percentage of individuals who tested positive for Schistosomiasis in each village.

"During the biannual treatment program, we examine the prevalence rate (percentage of positive cases per village) to identify areas exceeding 1%. For instance, Dodolo at 1.04% requires mass treatment. The challenge is - with only 382 residents and 7 positive cases, they should have fewer than 5 cases to achieve below 0. Something percent. Areas below 1% receive selective treatment, meaning only positive cases and their families receive medication. However, family members under 5 years old are excluded. But for villages reaching 2%, everyone undergoes mass treatment (though still limited to those above 5 years). This 2025 national mass treatment program mandated universal participation - we even had people from Palu return to their hometowns specifically for treatment." (Informant P)

In a prior account, informant K reported his participation as a test subject in 1972, before the introduction of Praziquantel for snail control in Napu. Following a confirmed diagnosis of Schistosoma infection, a liver biopsy was performed to evaluate the presence of worm eggs in human liver tissue, akin to previous studies conducted on mammals. Informant K had initially been prescribed Ambilhar; however, due to intolerable side effects, he transitioned to Praziquantel for treatment.

**"It turns out to be the same as in mammals. Schistosoma eggs were found in my liver. Then I took medication - not the current drug (Praziquantel), but Ambilhar, which I took for 7 days. The dosage was the same as the current treatment. But please excuse me, it made my urine turn yellow, which is why they switched to the current medication. The 7-day regimen depends on the egg count - whether there are many or few eggs, the point is you must complete the 7-day course to fully eliminate the Schistosoma eggs. The dosage depends on body weight - for 50kg, that's 5 tablets divided into two doses of two-and-a-half tablets each, with a strict 5-hour interval between doses that must be precisely timed."* (Informant K)*

In interviews conducted with informants regarding the treatment of Schistosomiasis in pregnant women, a consensus emerged: all informants agreed that the administration of snail

medicine or Praziquantel should be avoided in pregnant women, breastfeeding mothers, children under 5 years of age, and adults with severe health conditions, such as hypertension, heart disease, and hepatitis. Although some informants reported not having encountered any adverse effects related to Praziquantel in pregnant women, the caution against its use in these vulnerable populations was uniformly emphasized. As highlighted by informant K:

> *"For example, if a breastfeeding mother undergoes a stool examination and tests positive (for schistosomiasis), treatment is temporarily postponed. It depends on the mother—if she chooses to take the medication, she must pause breastfeeding for 3 days. Only after 3 days can she resume nursing. During the examination, there's always a doctor overseeing the process who knows the exact protocol. So, if a woman is found to be pregnant, we delay treatment until after delivery." (Informant K)*
>
> *"Actually, if following the medication guidelines, it shouldn't be dangerous for pregnant women. But as healthcare workers, we're advised not to administer it if in doubt. Even doctors refuse to do so. In fact, there might not even be side effects. We just don't want to take the risk. Previously, we lab personnel used to handle the treatment, but due to this being a central government program with inherent risks, things changed. Back then, they (central authorities) asked: 'Are there doctors at the Lab?' We answered: 'No.' So, they concluded that if any undesirable incidents occurred, there would be no one held accountable. That's why treatment administration was transferred to Puskesmas - since every Puskesmas has a responsible doctor. That was the central government's concern. For us lab staff - in our lab there are nine people, but I'm the only nurse. We have no supervising doctor. Naturally, we're apprehensive too. Obviously, if complications arise, doctors won't take responsibility either. But if the Puskesmas implements the treatment, doctors will definitely be accountable." (Informant P)*

Another statement was also expressed by informant O regarding the use of Praziquantel in children under 5 years:

> *"For the case in Toe, it involved underage children. We had to treat them, even though technically we shouldn't have. But they were already infected (with schistosomiasis). If we waited another two or three years, it would have been tragic - their bodies were already turning yellow. So, the doctor prescribed pediatric doses. Now they've recovered completely - running around healthy again." (Informant O)*

The observations detailed above indicate that the concerns surrounding Praziquantel are substantiated by its commonly reported side effects, which include dizziness, nausea,

headaches, vomiting, and, in some cases, fainting. Considering these findings, health professionals and relevant authorities have opted to exclude pregnant and breastfeeding women from the mass treatment program for Schistosomiasis. This decision stems from apprehensions regarding the potential adverse effects of Praziquantel on these populations and the associated risks to fetal health. Authorities also seek to mitigate their liability in the event of adverse outcomes among pregnant women who may receive the medication.

> *"Why must Schistosomiasis treatment be postponed for pregnant and breastfeeding women? Here's the thing - if we give medication to a pregnant woman and she dies, who takes responsibility? Prevention is better, right? In my 30 years of service, we've always postponed treatment for pregnant and nursing mothers. Even the Head of Health Office said to delay their treatment. Why take the risk? If age or physical condition isn't suitable, we won't risk it either. If we medicate a physically ill patient who then dies, people will blame the snail fever medication, won't they? It could happen, right? Patients do collapse sometimes. It depends on their physical condition - everyone's different. Those with high blood pressure can't take Praziquantel, and those with low blood pressure can't either." (Informant K)*

This doubt has an impact on the treatment of Schistosomiasis in pregnant women exposed to Schistosomiasis in 2014, as stated by informant R, a village midwife.

> *"Even the doctor at the Puskesmas said the same thing: 'Don't administer the medication.' But I felt sorry for her when I brought her to the Puskesmas—the only option was to provide vitamin supplements and nutritious food since treatment wasn't possible. So, we just gave her vitamins, and only after delivery would she receive the medication (Praziquantel). (We prohibited) breastfeeding temporarily to avoid any risks to the baby. It was heartbreaking to switch to formula milk, but we had to express her breast milk to prevent engorgement. The baby's birth weight was 2.6 kg—quite small. But we continuously supplemented her with vitamins: B12 injections, appetite stimulants, and iron supplements without pause. Now the child is in kindergarten and healthy. Ideally, if pregnant women could safely take the medication, they would. But if not, we wait until after delivery. Because to this day, the only drug available is still Praziquantel. According to the recent health department briefing (from Dinkes Palu), Praziquantel is dangerous for pregnant and breastfeeding women." (Informant R)*

The researcher then confirmed the truth of the above statement to one of the informants, who was a representative of the Provincial Health Service, regarding the prohibition on giving Praziquantel to pregnant women.

"Yes, we don't recommend (administering Praziquantel to pregnant women) because we're wary of past incidents. I can't recall the exact year - it happened before I joined this Health Office, and this is information I received from senior colleagues. The case occurred in Napu, where someone tried to induce abortion using Praziquantel. The fetus was expelled. There are no written regulations (SOP) regarding Praziquantel administration. We're simply following our seniors' practices and adhering to existing protocols." (Informant R)

However, an interesting statement was made by informant V regarding the use of Praziquantel:

"But during the screening of pregnant women, we encountered many cases where... how should I say it... women with fertility issues? Those who hadn't conceived for years. After taking the snail fever medication (Praziquantel), they became pregnant. This pattern was common. So, we suspect this medication might have fertility-enhancing effects."

"There was one case where a woman was already pregnant but didn't know it when she took the snail fever medication. This patient hadn't conceived for 12 years. She had one child before, but the child's development... let's say there were viral complications - the child's growth wasn't optimal. At the time, she was already nearly 3 months pregnant but hadn't realized it. After taking the medication, she later felt fetal movement. A pregnancy test confirmed it. The baby was born healthy. This suggests the medication might have eliminated harmful viruses." (Informant V)

Continued by informant V who revealed the follow-up to mass treatment of Schistosomiasis in 2024.

"We actually raised this issue during yesterday's Schisto meeting. You see, during our recent mass drug administration, we achieved nearly 100% community coverage. The Schisto team said there would be a follow-up mass stool examination three months later. But the evidence shows - even at my own house, the sample containers were never collected. This makes us doubt whether the stool screening was truly mass scale. However, the treatment was indeed comprehensive because we handled it directly - over 90% coverage. The remaining were mostly students in Palu or temporarily out of town. Even when they returned, their parents came to collect the medication. So, we reached about 98%, excluding pregnant and breastfeeding women. But the follow-up stool examinations... Moreover, even though their farms are in focus areas (for transmission), people have no choice but to work there for their livelihood. Take

Sedoa's case - their house is at the far end, clearly marked as a snail focus area, yet they still graze their buffaloes there." (Informant V)

In a separate instance, all pregnant participants expressed strong support for providing schistosomiasis treatment during pregnancy. When permitted by healthcare staff, they expressed willingness and awareness in taking praziquantel to mitigate the risk of transmission and infection of Schistosoma to their fetuses. One participant, referred to as Y, articulated her aspirations regarding the treatment of schistosomiasis in pregnant women:

"(Starting before pregnancy) I've already taken the medication three times. I'm willing to take it during pregnancy too, as long as it's permitted by health workers - if it's for my health, why not? When I took the medication, I felt dizzy, nauseous, and uncomfortable. Not exactly a headache, but lightheaded. It seems hard to get the medication because we must wait for mass treatment campaigns. Usually, midwives don't have it. We must wait for scheduled treatments. It would be better if the medication were available at accessible health posts like PUSTU or POLINDES." (Informant Y)

Schistosomiasis referral system in pregnant women

In an interview with informant E, it was noted that the responsibility for diagnosing and managing schistosomiasis in pregnant women is assigned to the attending midwife. This delegation also extends to the referral process.

"For Schistosomiasis screening or treatment in pregnant women, to my knowledge, they must first consult their midwife. If the midwife recommends it, they may need to go to the Schistosomiasis Laboratory. When a midwife identifies a case, they report it to the pregnant woman's midwife first, who then notifies the Puskesmas head. Only afterward is the Schistosomiasis Laboratory staff informed if a case is detected. All confirmed Schistosomiasis cases are referred to the Schistosomiasis Laboratory. To determine whether a pregnant woman is infected, a stool test is conducted first. If positive, treatment is provided by the Schistosomiasis team—but only after coordinating with the village midwife, given the pregnancy. Importantly, stool examinations aren't performed by midwives; they're handled exclusively by Laboratory staff." (Informant E)

However, in the case of Schistosomiasis in a pregnant woman found in 2014, after being confirmed positive, the pregnant woman was immediately referred to the Puskesmas by the village midwife.

"So, I reported it again there (at the Schistosomiasis Laboratory). I said, 'What's the solution?' Only then did I bring her to the (Puskesmas)." (Informant E)

Moreover, informant P indicated that the referral process closely resembles that

previously described by informant R. This referral protocol applies to all individuals who seek self-examination at the Schistosomiasis Laboratory, independent of mass stool testing initiatives.

> *"So, the process is: for example, community members bring stool samples to the Laboratory, where they're examined. If positive, the Laboratory team issues a referral to the Puskesmas. The Puskesmas then provides treatment." (Informant R)*

Schistosomiasis insurance system in pregnant women

In the Puskesmas Wuasa operational area, a significant proportion of residents possess government health insurance, specifically the Badan Pengelola Jaminan Sosial (BPJS) Kesehatan card. Although the availability of Praziquantel is limited under normal circumstances, during the mass treatment initiative, both informants and other residents were provided the medication at no cost, as the government fully funded the program.

> *"Mass screenings are free of charge. But for non-mass screenings, previously my colleagues would accept 'tip' from those who came. However, now we've instructed them to stop this practice, as it would be problematic if journalists found out." (Informant P)*

Informant R indicated that in 2014, the expenses associated with childbirth and medical care for pregnant women exposed to Schistosomiasis were fully covered by BPJS health insurance.

"It's heartbreaking - they're struggling financially, with the husband just being a farmer. Their home is way out in that remote area too. Thankfully she has BPJS (national health insurance), so the treatment was free." (Informant R)

Discussion

Schistosomiasis screening and diagnosis system in pregnant women

Pregnant women living in schistosomiasis-endemic regions face a risk of exposure comparable to that of the general population, particularly those engaged in agricultural activities near infested water sources. A case reported in 2014, involving a pregnant woman who tested positive for schistosomiasis, underscores the need for targeted screening or early detection strategies for this vulnerable group, despite the low incidence of cases. It is important to note that further cases may remain undetected, as most were identified incidentally through mass stool screening efforts. This indicates that such screening programs may not sufficiently reach all segments of the population.

Following the Regulation of the Minister of Health of the Republic of Indonesia

Number 21 of 2021, early detection of diseases in pregnant women can be done through minimum standard services known as 10 T, including weighing, measuring upper arm circumference, measuring blood pressure, measuring fundal height of the uterus, calculating fetal heart rate, determining fetal presentation, tetanus immunization, giving iron tablets, routine and special laboratory examinations (blood type examination, Hemoglobin levels, urine protein levels, blood sugar levels, malaria, syphilis, HIV, hepatitis and tuberculosis), and management or handling of cases.[8]

In regions where schistosomiasis is endemic, it is crucial to implement screening for schistosomiasis in pregnant women. This approach is crucial for the early detection and prevention of severe complications associated with schistosomiasis, including anaemia and malnutrition. These conditions can lead to low birth weight (LBW) and premature births. According to Friedman, it is vital to identify and assess the impact of schistosomiasis infection on pregnant women through observational research and therapeutic studies, as this can significantly enhance the quality of newborns in affected areas.[9]

The diagnostic approach for Schistosomiasis starts with the examination of stool specimens using microscopy. The Kato-Katz method, endorsed by the World Health Organisation and currently employed in the Schistosomiasis Laboratory in Napu, is recognised for its accuracy, practicality, and cost-effectiveness. This method, specifically designed for detecting Schistosoma japonicum, achieves 100% accuracy.[10] The examination tools utilised were provided at no cost through initiatives supported by the Ministry of Health, the Poso District Office, and the Research and Development Agency, all aimed at enhancing health infrastructure to combat Schistosomiasis in the endemic region of Napu.

Schistosomiasis screening and treatment in the Napu endemic area are conducted annually as part of the government's initiative to mitigate the variable incidence of the disease. The program has demonstrated success, evidenced by a decline in the number of individuals exposed to Schistosomiasis.[11] Consequently, it may be hypothesized that pregnant women in this region are less susceptible to Schistosomiasis exposure. Typically, pregnant women in the service area of the Napu Community Health Centre engage infrequently in activities outside their homes, such as gardening, rice cultivation, or river-related tasks. Nevertheless, some are still obligated to participate in these activities, particularly in villages classified as "focus areas," such as Toe (Dodolo) and Lanciran, which are situated near the coastal fringe of the village.

The case of a pregnant woman exposed to schistosomiasis in 2014 highlights a critical gap in the government's schistosomiasis control programs in the Napu endemic region,

particularly at the Puskesmas Wuasa. Notably, the patient was denied appropriate treatment with praziquantel due to concerns regarding potential adverse effects on the fetus. This situation underscores the necessity for the government to prioritize the health and safety of pregnant women in endemic areas, as they represent a vulnerable group at significant risk of schistosomiasis exposure.

One significant challenge in implementing faecal collection initiatives in the North Lore District is the growing disenchantment among the community regarding the annual faecal collection routine. This decline in engagement has negatively impacted faecal examination coverage in various villages, including Wuasa Village. The coverage of faecal examinations in Wuasa is notably lower than that of treatment due to multiple factors. Notably, the Wuasa community possesses a high level of knowledge and awareness regarding Schistosomiasis, which may contribute to reduced participation. Additionally, the geographical positioning of Wuasa Village—located in the centre of the sub-district—renders it somewhat distanced from disease focus areas. While some community members express satisfaction with the current examination process, a contingent remains that prefers a more adaptable examination schedule.

Schistosomiasis treatment system in pregnant women

Stool tests and mass treatment interventions indicated a significant reduction in the incidence of Schistosomiasis cases across the villages when compared to previous years. However, health officials express concern regarding a potential decline in mass treatment coverage. This apprehension stems from reported side effects of Praziquantel, which include episodes of fainting among recipients.[12] Additionally, the requirement for patients to administer Praziquantel twice daily raises concerns that individuals may experience psychological distress associated with the necessity of repeated medication administration.[13,14]

Praziquantel is considered to have a lower toxicity profile compared to historically utilised medications. The incidence of allergic reactions to praziquantel varies but typically includes symptoms such as dizziness, nausea, headache, vomiting, and, in some instances, fainting. The recommended dosing regimen for praziquantel is based on body weight, at a rate of 60 mg/kg. For instance, a patient with a body weight of 40 kg should receive a total of 2,400 mg per day, which equates to two tablets. The dosage is administered in two divided doses—one in the morning and another in the evening—with a recommended interval of 4 to 6 hours between doses. Patients will take one tablet in the morning and another in the evening.[15]

Extensive research has been conducted on the safety of praziquantel in pregnant women across various countries endemic to schistosomiasis, except for Indonesia. The findings consistently suggest that praziquantel does not pose significant risks to the fetus.[16,17]

Consequently, the Indonesian government, particularly in regions endemic to Napu schistosomiasis, should confidently administer treatment to pregnant women who test positive for the disease. This recommendation is further supported by feedback from pregnant women, who express trust in their healthcare providers and a strong willingness to engage in mass treatment initiatives. Notably, these women are open to receiving praziquantel despite being informed of potential side effects, such as dizziness, nausea, vomiting, and fainting.

Health centre officers have proactively addressed the anticipated side effects associated with the mass treatment program for Schistosomiasis. To mitigate these effects, additional medications such as Paracetamol, Chlorpheniramine Maleate (CTM), Antacids, and Vitamin B6 were administered. This approach is consistent with findings by Tandi, which documented a similar practice during a 2013 treatment initiative in Kaduwaa village, where patients received Paracetamol, CTM, and oral rehydration solutions in response to side effects like fever and allergic reactions following the administration of Praziquantel.[18] The treatment regimen for Schistosomiasis adhered to the technical guidelines established by the Sub-Directorate of P2B2 within the Directorate General of PPM and PLP, Ministry of Health, Republic of Indonesia, reflecting a rational and structured approach.

The prohibition against administering Praziquantel to pregnant women by healthcare professionals in North Lore District lacks a foundation in established regulations. This restriction is rooted in Regulation of the Minister of Health of the Republic of Indonesia No. 19 of 2018 regarding the Eradication of Snail Fever. The regulation comprehensively outlines activities for Schistosomiasis eradication, particularly in Article 13. Paragraph 1 specifies that Mass Prophylactic Drug Administration (Pemberian Obat Pencegahan Secara Massal, POPM) for snail fever is to be implemented for residents aged five and above in endemic regions. Article 13, paragraph 2, further indicates that the administration of POPM is to be deferred for pregnant women and individuals with severe illnesses.[19] However, this regulation does not delineate an exception for the administration of Praziquantel to breastfeeding mothers, making the prohibition against its use in this group unfounded. This situation suggests a possible oversight within the Schistosomiasis endemic area that necessitates urgent rectification through further research into the safety and effects of Praziquantel on breastfeeding mothers in the Napu endemic region.

The association between Praziquantel and fertility can be elucidated through a case report from the Jos Plateau, a known Schistosomiasis-endemic region in north-central Nigeria. A 40-year-old male presented with erectile dysfunction and perceived infertility after a decade of marriage. Although he had a history of alcohol use, he did not engage in drug use that could

affect his sexual function, nor was he a cyclist, which could compromise sperm production. Testicular examinations were unremarkable for nodules; however, sperm analysis revealed oligospermia. A biopsy of the left testicle identified S. mansoni eggs within the connective tissue. The patient underwent treatment with Praziquantel and Vitamin C, which effectively resolved his erectile dysfunction and restored sexual productivity within his marriage. The oligospermia was attributed to chronic lymphocytic infiltration and swelling resulting from the presence of worm eggs. This case highlights that early detection and treatment with Praziquantel can prevent infertility related to Schistosomiasis.[20]

Schistosomiasis referral and insurance system for pregnant women

To effectively combat Schistosomiasis, it is essential to not only focus on eradication efforts but also to evaluate the implementation of these activities. This evaluation ensures that, in the event of complications arising from Schistosomiasis in pregnant women or the broader community, the government can optimize the referral system. Additionally, establishing a synergistic and integrated insurance framework will enable affected individuals to access targeted and comprehensive health services.

Following Law Number 40 of 2004 regarding the National Social Security System (Sistem Jaminan Sosial Nasional, SJSN) and Law Number 24 of 2011 about the Social Security Administering Body, BPJS Kesehatan commenced operations on January 1, 2014. As a public legal entity, BPJS Kesehatan is responsible for overseeing a comprehensive health insurance initiative that covers all citizens of Indonesia. The primary objective of this National Health Insurance program is to ensure access to adequate health services for all individuals who either pay contributions or have their contributions covered by the Government.

The BPJS Obstetrics and Neonatal Services aims to ensure comprehensive care during pregnancy, childbirth, the postpartum phase, and the management of post-abortion haemorrhage. It encompasses postpartum family planning services and addresses complications associated with pregnancy and childbirth. Delivery services are organized in a systematic, tiered framework that follows established referral protocols.

Schistosomiasis is among the 155 diseases covered by BPJS Kesehatan at Primary Health Facilities. Consequently, individuals seeking schistosomiasis screening and treatment outside of the scheduled mass or selective treatments can access these services free of charge at registered Puskesmas. The management of complications arising from schistosomiasis will be under the guidelines and policies established by referral hospitals in Palu and other cities collaborating with BPJS Kesehatan.

In the Napu endemic area, the referral system operates as an integrated framework

between the Schistosomiasis Laboratory and the Puskesmas Wuasa. When residents receive a positive Schistosomiasis diagnosis from laboratory personnel outside of scheduled mass screenings, they are subsequently referred to the Puskesmas Wuasa for treatment. For pregnant women, the village midwife communicates the test results to the Schistosomiasis Laboratory for validation. The laboratory staff then refer these cases to the Puskesmas Wuasa for treatment and management under the oversight of the attending physician.

This study possesses several limitations that should be acknowledged. Conducted in a specific setting with a limited sample size, the findings may not be broadly applicable. The research depended on self-reported data obtained through interviews, which could introduce potential bias or inaccuracies. Furthermore, the brief data collection period may not adequately reflect seasonal variations or long-term trends in the management of Schistosomiasis. To corroborate these results, further research is warranted, utilising larger and more diverse samples along with longitudinal data.

Conclusion

The government's Schistosomiasis eradication program has made notable progress; however, it fails to adequately address the health needs of pregnant women in endemic areas, particularly in the Puskesmas Wuasa of Poso Regency. This population is at heightened risk for Schistosomiasis, and current government regulations, as outlined in Minister of Health Regulation Number 19 of 2018, conflict with WHO recommendations for treating expectant mothers. While the government has its reasons for postponing treatment, a collaborative effort involving health organizations is essential for a comprehensive reassessment and solution for pregnant women with Schistosomiasis. Effective management of complications can be achieved through coordinated care, including nutritional support and careful monitoring during pregnancy and delivery. A structured referral system had linked the Schistosomiasis Laboratory with the Puskesmas Wuasa, which facilitates the management of Schistosomiasis under the BPJS Health insurance scheme. This system ensures coverage for delivery costs and enables timely referrals for cases with complications, allowing for appropriate treatment from healthcare providers.

Conflicts of Interest

Nothing to declare.

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