

INCREASING THE ADHERENCE TOWARDS ORAL IRON INTAKE AMONG PREGNANT WOMEN AT KOTA BHARU DISTRICT HEALTH CLINIC

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Abstract

Poor adherence to antenatal oral iron intake among pregnant women remains a major concern, despite various research efforts and treatment interventions. This issue may lead to the development of anaemia, which carries severe complications for both mother and fetus, including the risk of premature birth and spontaneous abortion. In Kota Bharu district, a notable 5.75% of antenatal patients were diagnosed with anaemia at 36 weeks out of a total of 4648 mothers in the year 2017. A verification study done in 2018 at three health clinics under the Kota Bharu District Health Office (KBDHO), namely Badang, Kubang Kerian, and Ketereh Health Clinics, revealed that adherence towards antenatal oral iron intake was only 34%. Thus, a quality improvement project was initiated, aiming to increase adherence to a target of 80%. The adherence to oral iron intake was measured among the antenatal mothers using MyMAAT, a tool adapted from a local study. On the other hand, two additional questionnaires were administered to both antenatal mothers and pharmacists to identify factors contributing to the problem. This study unveiled contributing factors, including poor understanding of the importance of iron during pregnancy, poor nutritional knowledge, fear of potential iron's side effects, poor attitudes towards taking the medication, and less effective communication techniques by pharmacists. Nine strategies were then implemented, namely antenatal class talks, use of poster wheels, application of daily chart labels, introduction of All-In-One bookmarks, deployment of iron replicas, establishment of Mommy Hotline, the use of IRON Scan-ME, adoption of iron counselling checklists, and distribution of infographics. The Achievable Benefit Not Achieved (ABNA) gap was 46% in the pre-remedial phase, improved to 12% and 9% in the post-remedial phases. The percentage of antenatal mothers with haemoglobin levels $\geq 11\text{g/dl}$ at the 36-week increased from 57% to 64% following these interventions.

KEYWORDS: Adherence, Antenatal iron, Anaemia

Problem

The Kota Bharu District Health Office (KBDHO) serves the majority of Kelantan's population, amounting to approximately 608.6 thousand individuals out of a total of 1.88 million in the year 2017 (1). Within this population, an average of 15 thousand antenatal mothers were provided services by 12 health clinics under the KBDHO (2). Typically, each health clinic comprises an Outpatient Department (OPD) and Maternal and Child Health (MCH) units. All clinics under KBDHO are equipped with in-house pharmacies, laboratories, and dental services, except for the UTC Health Clinic (formerly known as 1Malaysia UTC Health Clinic), which does not offer laboratory services. A health clinic is overseen by a Family Medicine Specialist (FMS) or a senior medical officer who is responsible for supervising both the OPD and MCH units. The MCH unit is dedicated to women's health including pre-pregnancy care, antenatal care, postnatal care and child health care. This unit is led by a Nurse Manager, followed by the Head of Staff Nurse and staff nurses. On a daily basis, the total attendance of antenatal mothers across all clinics under KBDHO ranges between 80-100 individuals.

Anaemia has consistently ranked among the most frequently diagnosed issues in pregnant women, even though it has been extensively studied and addressed (3,4). One of the ways to overcome or prevent anaemia is by the intake of oral iron supplementation throughout the course of pregnancy (3). To facilitate this, pregnant women will receive antenatal iron supply from the attending pharmacist at the dispensing counter. Additionally, they will receive counselling if deemed necessary during each follow-up visit. Iron supplementation can be initiated for all antenatal patients as early as the fourth week of gestation.

In 2017, the incidence of anaemia among antenatal patients at 36 weeks was 5.75% (267 cases out of 4,648 mothers), a 0.75% higher than the target allowed nationally (2). A verification study conducted in April 2018 within three health

clinics under KBDHO - Badang Health Clinic, Kubang Kerian Health Clinic and Ketereh Health Clinic - revealed that only 34% of antenatal patients adhered to the recommended oral iron intake. Given the substantial prevalence of low adherence to antenatal oral iron intake and the limited local studies addressing this issue (3), a quality improvement study was initiated. The primary aim of this study was to propose strategies to increase antenatal oral iron intake among pregnant women from 34% to 80% within 18 months. This initiative was intended to decrease anaemia, consequently attaining the recommended haemoglobin levels among pregnant mothers.

Background

Haemoglobin (Hb) is the red pigment present in the red blood corpuscle, responsible for transporting oxygen from the lungs to the body's tissues and myoglobin, which acts as an oxygen reservoir within muscles (3,4). The formation of Hb necessitates iron, folic acid, other vitamins, and trace elements (4). Iron, an essential mineral for humans, is crucial in bolstering Hb production and generating additional red blood cells. During pregnancy, the demand for iron intensifies due to the augmentation of the red blood cell mass and the transfer of increased iron quantities to both the growing fetus and the placental structures. Despite dietary iron intake, the increased requirement cannot be met, hence giving rise to the need for oral iron supplementation (5). Compounded by the decreased bioavailability of nutrients among pregnant women, solely relying on dietary intake proves insufficient to meet the required iron demands (6). Various studies have advocated for 100mg of iron supplementation with 5mg of folic acid for pregnant women (7-9), which ideally commence between the 10th and 12th week of gestation (3).

According to the World Health Organization (WHO) classification, the cut-off value indicating anaemia in pregnant women is a Hb level <11.0 dL/g (4). Notably, a WHO survey conducted

in Malaysia in 2009 reported that 38% of pregnant women experienced anaemia (10). A cross-sectional study conducted by Jamaiyah in 2007 revealed that within 56 primary healthcare clinics across Malaysia, the prevalence of anaemia among pregnant women was 35% (11). Hassan's study in 2005 further supported this observation by reporting a prevalence rate of 34.6% for anaemia in the Kubang Kerian Kelantan antenatal clinic (12).

Anaemia during pregnancy has been associated with adverse effects on both maternal and child health, substantially increasing the risk of maternal and perinatal mortality (13,14). The maternal repercussions include fatigue, reduced work capacity, impaired immune function, increased risk of cardiac diseases, and even mortality (14-16). This was further evidenced by a study that showed anaemia during pregnancy contributed to 23% of indirect causes of maternal deaths in developing countries (17). The repercussions extend to the fetus or neonate, where anaemia during pregnancy can result in fetal growth retardation, stillbirth, premature birth as well as slow intrauterine growth (17).

One of the common causes of anaemia in pregnancy is low adherence to iron supplementation. A study undertaken in an urban slum area in India found that the overall adherence to iron intake among pregnant mothers was 61.7% (18). Similarly, in Malaysia, a cross-sectional study aimed at assessing adherence to vitamin and mineral supplementation among pregnant women attending public antenatal clinics, both in urban and rural areas in 2010, revealed that only 49.2% of subjects adhered to the vitamin and mineral supplementation (3). This study also showed that the prevalence of anaemia was lower in the group that demonstrated adherence compared to the non-adherent group (3). Another study conducted in North-Western Tanzania showed that the adherence to iron-folic acid supplementation among pregnant women in Kasulu Communities was notably low, which was 20.3% (19). Meanwhile, in

Northwest Ethiopia, a study reported that the adherence rate to iron and folic acid supplementation among pregnant women in Aykel town was 47.6% (6).

Low adherence to antenatal iron intake among pregnant women can be attributed to several common factors. These include gastrointestinal side effects, such as loss of appetite, epigastric pain, nausea, vomiting, dark-coloured stools, abdominal cramps and constipation (20,21). Furthermore, factors related to healthcare providers could also impact adherence. These include insufficient patient education provided by healthcare professionals. Additionally, various patient-related factors such as inadequate utilisation of antenatal health services, poor nutritional knowledge, attitudes, and behaviours influence the women's understanding of tablet utilisation as well as their concerns regarding the taste and smell of the tablets (20,21). Moreover, within the community, misconceptions exist that iron supplementation might lead to having a larger baby or cause an increase in the mother's body weight (20,21).

A study conducted in the United States showed significant improvement in adherence through various strategies. Ensuring the consistent availability of iron supplements, giving advanced warnings about potential iron-related side effects, involving patients in the therapeutic strategy, and providing reminders such as posters and calendars were all found to enhance adherence (22). In an urban slum area in India, compliance with iron pills corresponded to the level of education, early antenatal booking, increased frequency of antenatal visits, awareness of haemoglobin levels, and knowledge of the prescribed iron pill dose (18). Similarly, the role of health professionals in counselling was found to be important in enhancing compliance with iron supplementation, as reported in a study in India (23).

Measurement

We used the Malaysia Medication Adherence Assessment Tool (MyMAAT) to assess adherence, where good adherence

was defined as having a score of $\geq 50\%$ and having a score of $< 50\%$ was considered poor adherence (24). The indicator for the percentage of adherence was calculated as the number of pregnant women with good adherence to antenatal oral iron over the total number of pregnant women taking antenatal oral iron as below:

$$\frac{\text{Percentage of adherence towards antenatal oral iron intake among pregnant women}}{\text{Number of pregnant women taking antenatal oral iron}} = \frac{\text{Number of women taking antenatal oral iron showing good adherence}}{\text{Number of pregnant women taking antenatal oral iron}} \times 100\%$$

The MyMAAT tool was developed by the Pharmaceutical Services Program in collaboration with the Faculty of Pharmacy, *Universiti Kebangsaan Malaysia* (UKM), to measure the level of patient adherence to medication in Malaysia. This tool was prompted by the discontinuation of the 8- items Modified Morisky Medication Adherence Scale (MMMAS) in 2017. Instead, the MyMAAT tool has been introduced, encompassing a total of 12 items specifically tailored for pregnant mothers who have commenced oral iron supplementation. These items are designed to measure various aspects of medication-taking behaviour and to identify potential reasons contributing to non-adherence.

This study included all pregnant women receiving follow-up care at the three selected clinics who have been prescribed oral iron for a minimum of one month. However, certain exclusions were applied, including antenatal patients who received iron injections, experienced miscarriages, were transferred to different clinics, had a history of anaemia-related illness, or refused to answer the MyMAAT survey. The pregnant women considered for inclusion had been prescribed oral iron supplements in alignment with their next scheduled appointment, which commonly took place a month after the initiation or supplied with iron supplements.

The baseline or verification phase was done in April 2018 to determine the magnitude of non-adherence to oral iron intake among pregnant mothers.

At the same time, two different types of questionnaires were given to the non-adherent pregnant women and to the pharmacists in order to determine the contributing factors to non-adherence. These questionnaires were adapted from previous studies that explored potential causes of non-adherence and the effectiveness of counselling provided by pharmacists (22,23). Our study focused on three types of iron supplements, namely ferrous fumarate 200mg, Zincofer® and Maltofer®. The standard was set at 80% as advocated by the District Chief Pharmacist and unanimously agreed upon. This benchmark exceeds the adherence rate of a study done in Ethiopia where the standard was set at 65% (25).

The post-remedial phase I (Cycle 1) and phase II (Cycle 2) data were subsequently collected in August 2018 and January 2019, respectively. The verification phase result showed that out of the 239 samples taken in April 2018, 34% (n=82) demonstrated adherence and 66% were classified as non-adherent.

Initial Assessment of the Problem

The existing process of care was reviewed and the critical step identified was the counselling process (26). It was observed that the adherence of pregnant women to antenatal oral iron intake could be influenced by the counselling sessions provided by the pharmacists (27). During the pre-remedial data collection phase, it was noted that only simple advice with correct dose, frequency, indication and administration time was given instead of emphasising the importance of iron supplementation, iron-food interaction, and complications of anaemia due to iron insufficiency. The process of care was revised to enhance the counselling sessions. Following consultation with doctors or nurses in the MCH unit, pregnant women were prescribed antenatal oral iron and received counselling on proper administration from pharmacists, with documentation. During the counselling sessions, the pharmacist also assessed adherence to antenatal oral iron intake and explored the potential factors contributing

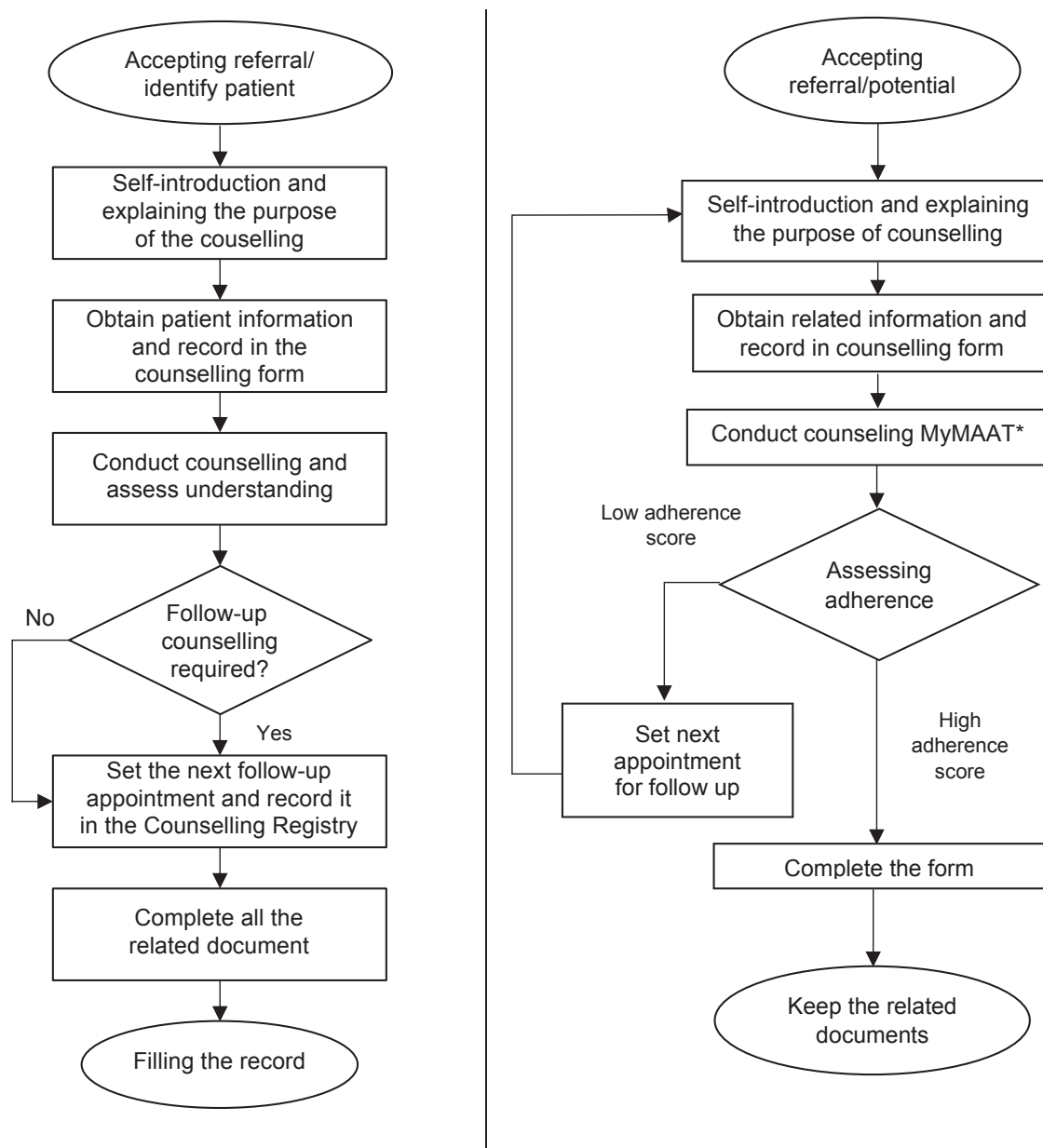


Figure 1: The initial (left) and revised (right) process of care for patient counselling at the pharmacy (* indicates critical step)

to non-adherence. Pregnant women who were found to be non-adherent were scheduled for follow-up counselling during their subsequent appointments. The initial and revised process of care is illustrated in Figure 1.

Of the 66% (n=157) sample with non-adherent, we identified that poor understanding of the importance of iron, fear of the iron’s side effects, lack of nutritional knowledge, hesitancy towards oral iron intake, and perceived ineffectiveness of counselling by pharmacist had contributed to the problem (Figure 2).

The result revealed that only 31% of pregnant women exhibited a good understanding of the importance of antenatal iron. Additionally, 32% showed better nutritional knowledge, 36% were able to accept the side effects of iron, 37% showed a positive attitude towards antenatal iron intake, and only 47% rated the communication technique of pharmacists as effective.

Strategy

The post-remedial phase involved two QA cycles where the first cycle (Cycle 1) was carried out from May to July 2018,

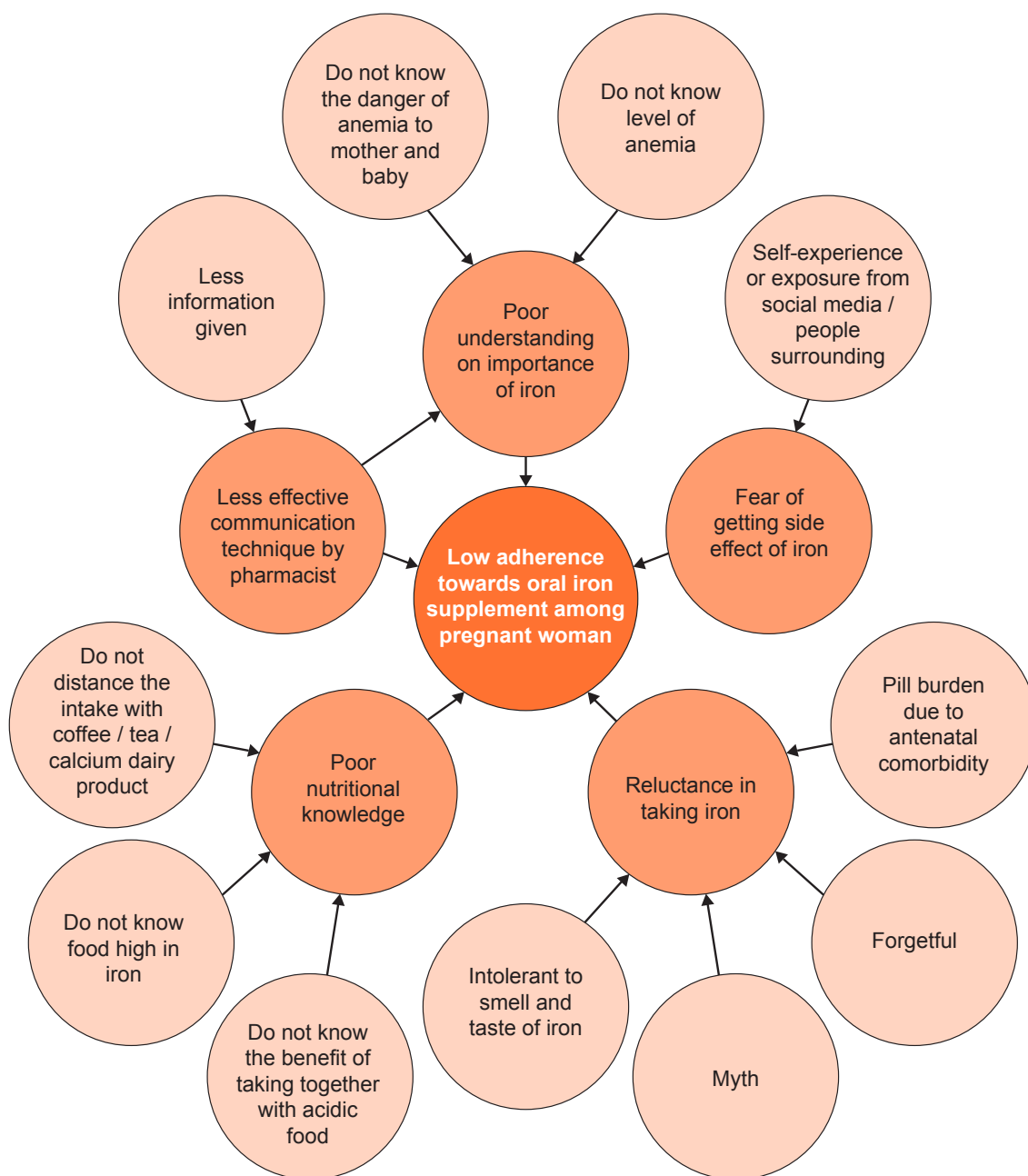


Figure 2: Problem analysis chart for failure of fissure-filled teeth in six months post-application

followed by evaluation in August. The second cycle (Cycle 2) was executed from September to December 2018, followed by evaluation in January 2019. We introduced six strategies during Cycle 1 and three additional strategies during Cycle 2.

During Cycle 1, Strategy 1 used an All-In-One bookmark consisting of important information related to anaemia, a column for tracking Hb levels with emoticons to mark progress during each follow-up appointment, as well as a diagram illustrating a high iron diet to enhance the patient's understanding. With this approach, the monitoring of Hb levels

by prescribers and nurses became easier as it eliminated the need to flip through the extensive antenatal book and search page by page for Hb levels. Instead, a glance at the bookmark provided a comprehensive overview of Hb progression. However, it was noted that some patients lost the bookmark between follow-up appointments.

Conversely, Strategy 2 focused on enhancing the nutritional knowledge among pregnant women to avoid unnecessary drug-food interactions, and expansion of the pharmacists' role in patient care. Pharmacists were directly involved with patients and healthcare

professionals during antenatal class as opposed to their distance engagement before. In this strategy, pharmacist talks were incorporated into the antenatal classes, emphasising the interaction of iron with certain foods or beverages. The talks were scheduled to occur regularly every month on weekdays, hosted in the meeting room. Lunch and small tokens like goody bags and pens were provided to encourage patients' participation. However, unanticipated factors, such as logistic issues and adverse weather conditions, resulted in low attendance rates, with only 72% attendance recorded despite the expectation of full attendance across a total of 30 sessions.

In Strategy 3, we created a poster wheel to assist pharmacists and nurses in conveying information related to the side effects of iron supplementation and strategies to overcome them. The poster wheel featured main side effects designed in two sizes for MCH and the pharmacy counter. Although we managed to increase the subject's acceptance towards the side effect of iron up to 55% at the end, however, nurses expressed their concerns that using the poster wheel was time-consuming. Patients were occasionally reluctant to spend time listening to the explanation by the nurses or pharmacists on managing the side effects. Based on this feedback, we realised that the implementation was unlikely to be sustainable after the project ended.

In Strategy 4, we activated Mommy Hotline, facilitating direct communications between patients and pharmacists. This was intended to make it more convenient for patients to reach out with any concerns, especially those related to iron side effects. Although we expected to receive calls from pregnant women or patients on iron-related questions, there were instances where patients mistakenly assumed that the hotline was a customer service helpline, prompting them to ask to be connected to the MCH clinic for other matters.

In Strategy 5, a comprehensive iron counselling checklist was developed and used as a pharmaceutical counselling aid

to increase the effectiveness of delivering iron-related information to patients and enhance communication between pharmacists and pregnant women. The pharmacist provided the counselling points step-by-step according to the information stated in the checklist. Despite showing potential benefits, this strategy revealed certain drawbacks. The implementation of the checklist might be time-consuming, especially during peak hours.

In Strategy 6, to address the attitude issue, we affixed a daily chart label containing 30 tick boxes (equivalent to 30-day period) to the medication envelope. Each box was marked daily to signify pregnant women's discipline in daily iron intake. This approach received much encouraging feedback from patients highlighting the benefits of this measure, as it helped in their routine monitoring of daily iron intake.

During the Cycle 2, we introduced three new additional strategies. In the first additional strategy, Strategy 7, we made a QR Code sticker (IRON-ScanME) to improve the patient's understanding of the importance of iron. The QR code sticker served as an easy platform for patients to access educational videos covering anaemia and iron deficiency topics. Positioned on the antenatal book, patients could scan the QR code using their smartphones at their convenience.

In the second additional strategy, Strategy 8, we made a large replica of the different types of iron supplements available in the health clinics, which included information such as the onset of action, administration instructions, and the quantity of elemental iron contained in each supplement.

In the third additional strategy, Strategy 9, we distributed infographics related to Myth versus Fact on oral iron to rectify some individuals' negative perceptions about iron supplementation. Concurrently, the antenatal classes were strengthened and expanded, in which educational materials were gradually distributed to other nine health clinics within the Kota Bharu district.

Table 1: Model of good care for the counselling of antenatal woman receiving oral iron supplement in pharmacy

No	Critical step	Criteria	Standard	Pre-remedial phase	Post-remedial Phase 1 (Cycle 1)	Post-remedial Phase 2 (Cycle 2)
1.	Counsel antenatal mother receiving the oral iron supplement	Giving instruction on dose, frequency, indication, time of administration	100%	100%	100%	100%
		Giving instruction on the side effects of iron supplement	100%	36%	55%	55%
		Assess understanding towards the importance of iron and anaemia	100%	31%	81%	85%
		Provide effective communication techniques throughout counselling sessions	100%	47%	89%	89%
		Assess adherence towards the oral iron intake	100%	34%	68%	71%
		Assess attitude towards the oral iron intake	100%	37%	69%	72%
		Educating on drug-food interaction	100%	32%	76%	79%

Results

All standards set in the model of good care showed improvements from the pre-remedial phase to the post (Table 1). In terms of adherence, we observed a remarkable improvement from 34% to 68% and 71% in Cycle 1 and Cycle 2, respectively as in Figure 3. The result revealed that there remained a 9% gap in achieving the targeted 80% standard for adherence to oral iron intake.

Overall, there was an improvement in all five factors during Cycle 2 when compared to the pre-implementation phase although a minimal increment was observed in the later Cycle. The three additional strategies applied during Cycle 2 (QR code

sticker, replica of irons and infographics) involved relatively less interaction between healthcare professionals and subjects compared to the antenatal class programme in Cycle 1. These strategies depended on self-driven motivation and self-awareness, differing from Strategy 6 (chart label strategy), where pregnant women were obligated to tick the box daily. Despite this, all three approaches (QR code sticker, replica of irons and infographics) were used throughout the project due to their efficiency in terms of time and resources and their ability in conveying information to the subjects. Upon these implemented strategies, pregnant women showed a better understanding of the importance of iron (a substantial increase from 31% to

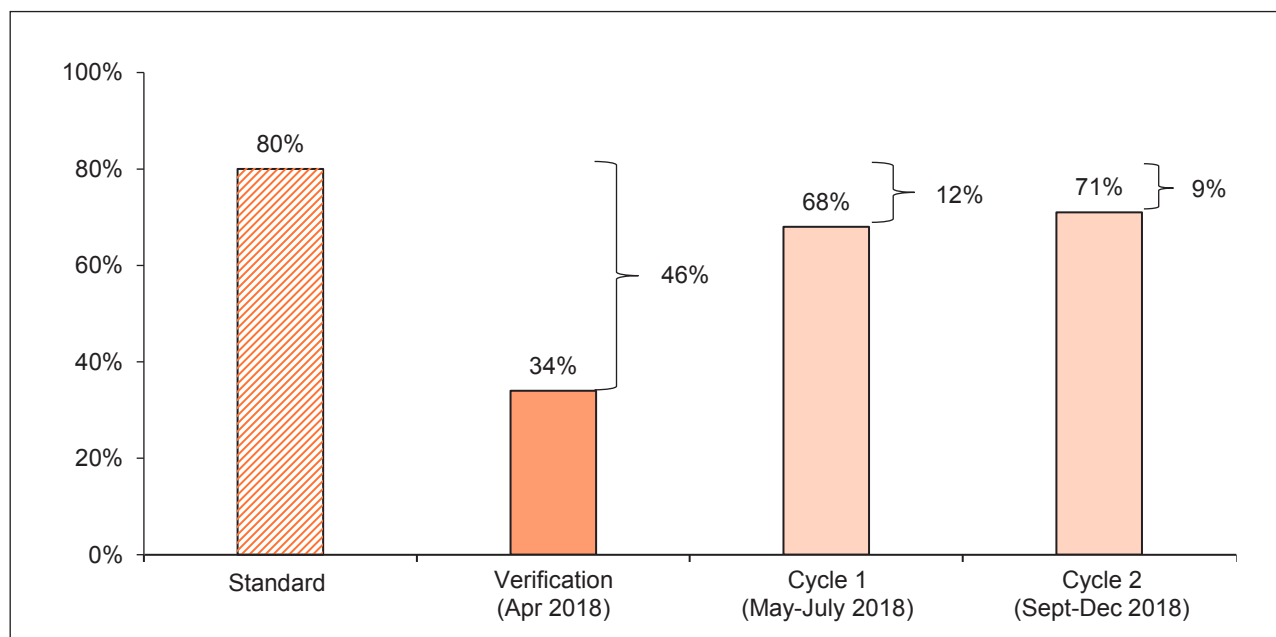


Figure 3: Percentage of adherence towards iron intake among pregnant women.

85%). Similarly, their nutritional knowledge improved from 32% to 79%. They also demonstrated better acceptance towards iron's side effects (36% to 55%) with an improved attitude towards iron intake (32% to 72%). Through these remedial actions, the communication between pharmacists and patients became more effective, as evidenced by the improved pharmacist score based on the iron counselling checklist (47% to 89%). We also managed to reduce the ABNA readings from 46% to 9% following the second cycle of the QA study (Figure 3). This study also led to an increase in the patient's normal Hb readings ($Hb \geq 11$). Overall, the prevalence of anaemia among the pregnant mothers attending these clinics decreased from 73% during the pre-remedial phase to 36% after Cycle 2.

Lessons and Limitations

This study imparted a crucial lesson to us that multidisciplinary collaboration among healthcare professionals, especially uniting the pharmacy and nursing units could help achieve better patient care by enhancing the current work process and focusing on patient-related perspectives. Effective counselling provided by pharmacists also contributed to bolstering patient adherence

to medication intake; hence, continuous education and awareness activities need to be emphasised.

One of the strengths of this project was its implementation as a multi-centre project. The result from this project allows us to gather insights regarding adherence towards antenatal oral iron intake among pregnant women locally.

Despite the desired outcome obtained, it is important to acknowledge the challenges that we encountered during the course of this project. One noteworthy challenge was the potential for missing data due to the absence or unavailability of the designated individual responsible for data collection. To address this problem in future, we suggested that data be collected daily by any pharmacy staff, ensuring a consistent and reliable data collection process. In addition, certain strategies, such as Strategy 1 (bookmark), Strategy 3 (poster wheel), and Strategy 7 (QR code), posed a burden on the workload of staff nurses, who perceived that explaining the purpose of the bookmark, information in the poster wheel and QR code was time-consuming.

Apart from that, the use of convenience sampling also imposed potential bias into our study. The approach relied on the availability of healthcare

workers and patients on specific data collection days, which might not accurately represent the entire population of pregnant women in the Kota Bharu district. Therefore, the findings restrict the generalisability to the broader population of Malaysia. Another major challenge in this study was the rapid turnover of project members due to the dynamic nature of their job scopes and responsibilities.

Strategies such as antenatal bookmarks, daily chart labels, and Iron Scan-Me can be replicated in other healthcare clinics following positive feedback from both staff and patients. This was evidenced by the continuity in the strategies implementation, indicating their sustainability over time. These strategies were mainly monitored by the pharmacist in collaboration with the MCH department.

Through the improvement measures implemented, we observed that pregnant women had improved adherence to iron intake, potentially contributing to the improvement of their Hb levels. Nevertheless, it is important to acknowledge that subjects' heightened awareness of their involvement in the study might influence their responses to the MyMAAT questionnaire, possibly leading to more conscientious answers. Interestingly, this study demonstrated a reduction in drug waste as evidenced by the reduced return of unused iron medication to the pharmacy for 18 months following the introduction of the improvement steps in March 2018.

Conclusion and the Next Steps

The project team identified the contributing factors and devised targeted interventions to address these issues. Consequently, there was a noticeable increase in the percentage of adherence to antenatal oral iron intake among the pregnant women enrolled in the study. At the end of this project, the adherence rate surged from 34% during the pre-implementation phase to 71% after the second cycle. Furthermore, the prevalence of normal Hb levels among the study respondents had increased from 27% during the pre-remedial phase to 64%

after the second cycle. In summary, the positive results in the adherence to oral iron intake among pregnant women at the KBDHO underscore the effectiveness of the implemented strategies that were improved during this project.

Moving forward, we would like to continue the educational activities for pregnant women through engaging group sessions. These sessions are aimed at enhancing awareness and understanding of the value of adherence to oral iron intake. We also committed to publishing this study in written publications and informative posters through suitable avenues to help standardise and improve the development of antenatal care initiatives. We also plan to extend the reach of our strategy materials to all health clinics across Kelantan to help other facilities that encounter similar challenges.

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Conflict of Interest

The authors declare that there was no conflict of interest.

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