



Contents lists available at ScienceDirect

Exploratory Research in Clinical and Social Pharmacy

journal homepage: www.elsevier.com/locate/rcsop

How can pharmacists contribute to anaemia management? A review of literature and exploratory study on pharmacists' role in anaemia



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ARTICLE INFO

Keywords:

International pharmaceutical federation (FIP)
Iron deficiency anaemia
Pharmacy workforce development
Pharmacist role

ABSTRACT

Background: Iron deficiency anaemia (IDA) is the leading cause of anaemia globally, most frequently found in children and pregnant women. With their increasing role in the healthcare system, pharmacists may contribute to the management of anaemia. Through the International Pharmaceutical Federation (FIP) Multinational Needs Assessment Programme, the FIP explored the contribution of pharmacists in anaemia, specifically IDA, focusing on five countries: India, Indonesia, Malaysia, Philippines and Singapore.

Objective: To explore information on pharmacists' roles in a variety of settings related to 1) IDA management; 2) education and training needed to support the roles; and 3) barriers and enablers to expanding or developing the roles.

Methods: This study involved a literature review and a focus group discussion with twelve participants selected purposively and nominated by national professional leadership bodies across five countries. A literature search was conducted using PubMed Database. A focus group discussion explored pharmacists' roles, education and training needs, as well as barriers and enablers to support their roles in anaemia management, specifically in IDA. A codebook thematic analysis approach was conducted according to the study objectives.

Results: Sixteen articles were included in the analysis. The pharmacists' roles in anaemia identified from literature ranged from patient management and monitoring, collaboration with other healthcare professionals and involvement in guideline development, in which the roles vary according to the workplace. Twelve participants attended the focus group discussion. Participants highlighted pharmacists' roles in screening and detection, medication therapeutic management, patient counselling and patient monitoring. Participants emphasised a need for guidelines or toolkits with subsequent training or workshops to support their competency development in anaemia. Monitoring the success of pharmacist delivered anaemia programmes was recommended to support advocating for active pharmacist roles.

Conclusion: Pharmacists have a growing opportunity to contribute to achieving the global targets on anaemia through their involvement in screening and managing anaemia and increasing anaemia awareness among the patients and community.

1. Introduction

Anaemia is a global health problem, more prevalent in children and pregnant women. The World Health Organization (WHO) estimates that anaemia affects half a billion women of reproductive age (15–49 years),¹ 40% of pregnant women and 42% of children under five years of age worldwide.² The consequences of anaemia can be immediate and more prolonged.³ Pregnant women with anaemia are more likely to suffer from premature birth,⁴ low birth weight,^{5,6} and maternal and perinatal mortality.^{3,7,8} Anaemia in children and infancy has consistently been associated with poor cognition, school performance, and more behavioural problems in middle childhood.^{9,10} Moreover, anaemia may impair

cognitive and physical abilities, reduce productivity, increase susceptibility to infections, and increase morbidity and mortality, which can have economic consequences.^{3,8,11,12}

The WHO has therefore set a goal of controlling anaemia as a global health priority: “to achieve a 50% reduction of anaemia among women of reproductive age by 2025”.¹ The prevalence of anaemia among women in productive age was also added as United Nations Sustainable Development Goals Indicator 2.2.3 in 2020.¹³ Since then, there has been a decline in the prevalence of severe anaemia in non-pregnant women and children aged 6–59 months, as well as moderate and severe anaemia in pregnant women. However, globally and in most regions, the prevalence of mild anaemia, which has less severe health effects, barely changed in all

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<http://dx.doi.org/10.1016/j.rcsop.2023.100231>

Received 9 December 2022; Received in revised form 27 January 2023; Accepted 27 January 2023

Available online xxx

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population groups.¹⁴ In general, there has also been poor progress towards the global anaemia target, particularly in low-income and middle-income countries (LMICs).^{14,15} There is a need for leadership and coordination initiatives at the international, regional, and local levels to reduce anaemia, particularly with stakeholders heavily involved in women's health care.¹⁶ A data-driven approach is essential to determine how best to strengthen and maximise the effectiveness of anaemia-related interventions.

More efforts are required to further understand the causes and severity of anaemia in each country.¹⁴ One of the leading causes of anaemia, estimated to be half of the global burden, is due to iron deficiency.^{17,18} Iron deficiency anaemia is one of the top five causes of years lived with disability globally and the leading cause of years lived with disability in LMICs. It is also the main factor of years lived with disability among women across 35 countries.¹⁹ With the increasing role of pharmacists in the healthcare system and as one of the most accessible members of the health workforce,^{20–22} pharmacists can contribute to anaemia management, such as in a community setting, they may provide health information on preventing and managing iron deficiency anaemia.²³ Another example is in a hospital setting where pharmacists can contribute to monitoring and adjusting treatment plans to optimise patient outcomes.²⁴

The International Pharmaceutical Federation (FIP) is a global body representing over four million pharmacists, pharmaceutical scientists and pharmaceutical educators worldwide. FIP has a mission to support global health by enabling the advancement of pharmaceutical practice, sciences and education,²⁵ which includes collating and validating global data on the pharmacy workforce, practice and pharmaceutical science. Undertaking comprehensive analysis of global health problems, including iron deficiency anaemia, for example, provides accessible, high-quality intelligence that supports pharmaceutical leadership bodies in their work. The FIP Multinational Needs Assessment Programme (MNAP) is a continuing broad scope programme aiming to establish national needs and priorities and to provide a framework for data-driven, evidence-based projects according to established needs. The programme includes assessing current pharmaceutical healthcare policy needs via existing evidence obtained from national leadership body engagement and identifying gaps and actions in addressing the needs.²⁶ Focusing on the roles of pharmacists in the treatment of iron deficiency anaemia, this project includes a systematic literature search in conjunction with focus group discussion data to collate evidence on the current situation of pharmacists' roles. The objectives were to explore information about pharmacists' roles in a variety of settings related to 1) IDA management; 2) education and training needed to support the roles; and 3) barriers and enablers to expanding or developing the roles.

2. Methods

This study comprised two phases, a systematic search and review of the literature and a qualitative focus group discussion with selected experts nominated from national professional leadership bodies in India, Indonesia, Malaysia, Singapore and the Philippines.

2.1. Systematic search of literature review

A systematic search on PubMed Database was conducted from the inception of the database up to 10 May 2022 and resulted in 206 publications using the following Mesh term (“Anemia”[Mesh]) AND (“Pharmacy Research”[Mesh]) OR (“Education, Pharmacy”[Mesh]) OR (“Education, Pharmacy, Continuing”[Mesh]) OR (“Pharmaceutical Services”[Mesh]) OR (“Pharmacy Technicians”[Mesh]) OR (“Community Pharmacy Services”[Mesh]) OR (“Pharmacies”[Mesh]) OR (“Pharmacy”[Mesh]) OR (“Pharmacists”[Mesh])). In addition, manual searches were carried out by reviewing the listed references of papers. Fig. 1 shows the PRISMA chart of the screening process. Articles were included if the papers described the roles of pharmacists or pharmacies in anaemia. Articles were excluded if the papers described anaemia management or treatment, but were not related to pharmacists' involvement. The first author of this paper conducted a screening process and analysis using NVivo, a qualitative data analysis

software. The following information was converted into ‘nodes’ in NVivo to aid the analysis: 1) Country; 2) Author; 3) Year; 4) Type of publication; 5) Study design; 6) Aim; 7) Participant; 8) Setting; 9) Type of anaemia; 10) Topic; 11) Roles of pharmacists, 12) Education and training programme, 13) Study limitation.

2.2. Focus group discussion

The participants were recruited purposively by approaching professional leadership bodies of India, Indonesia, Malaysia, the Philippines and Singapore. In addition, FIP's Community Pharmacy Section and programme team members of FIP were invited to nominate experts on this topic for the specific countries. A total of 15 experts were identified and invited to participate in the focus group discussion (FGD). In addition to participants, a moderator and a facilitator for note taking were present in the FGD. A topic guide was developed according to the objectives of the study. The content of the topic guide can be seen in Fig. 2. The FGD was recorded, and meeting notes were compiled, recorded, and returned to participants to validate and add further feedback. The first author conducted the qualitative analysis utilising a codebook thematic analysis approach.²⁷ NVivo was used to support the coding. After conducting initial coding, codes were categorised into themes according to the study's objectives: roles of pharmacists in iron deficiency anaemia, education and training to support pharmacists' roles and barriers and enablers for expanding pharmacists' roles. All authors reviewed the final report of analysis.

Formal ethical approval was not deemed to be required; data were not related to patient or individual protected characteristics and were neither confidential nor commercially sensitive. Ethical oversight and approval were gained from the FIP Executive Boards and Board structures and are on record. Information provided by participants (who were representatives of organisations) was not attributed to individuals and participation in the study was voluntary. Access to the data was kept secure and restricted to the project team directly involved in this study. Participants were asked for written consent to participate. Prior to the focus group meetings, an explanation of the structure of the focus group discussion was provided including assurance of confidentiality and the right of participants to decline or not participate in the discussion. Participants were asked for verbal consent to record the discussion and participants were asked for written consent for the anonymised quotes that are utilised in the manuscript reporting.

3. Results

3.1. A systematic search of the literature

From 209 records identified from PubMed and other sources, 181 articles were excluded after titles and abstracts screening. Twelve articles were further excluded after full-text screening because they were not related to the roles of pharmacists in anaemia but related to other areas such as the management of sickle cell, beta-thalassemia, and medication adherence in chronic kidney disease. This literature review describes the roles of pharmacists in anaemia, in general, considering not much literature found on the roles specific to iron deficiency anaemia. Fig. 1 shows the PRISMA chart of the systematic search. A total of 16 articles were included in this review.

3.1.1. Study range and characteristics

The majority of short-listed articles were from the United States (n:5),^{28–32} followed by two articles from Japan,^{33,34} and the rest from Canada,³⁵ France,³⁶ Iraq,³⁷ Jordan,³⁸ Malaysia,³⁹ Nepal,⁴⁰ Peru,⁴¹ Tanzania,⁴² and Thailand.⁴³ The most common designs (n:6) used in the articles identified, were retrospective studies involving reviewing medication charts to evaluate the impact of pharmacists' roles in anaemia management.^{28,30–33,35} Three included studies that utilised randomised controlled trials to investigate the effect of pharmacists' interventions in anaemia management associated with chronic kidney disease,³⁷ among

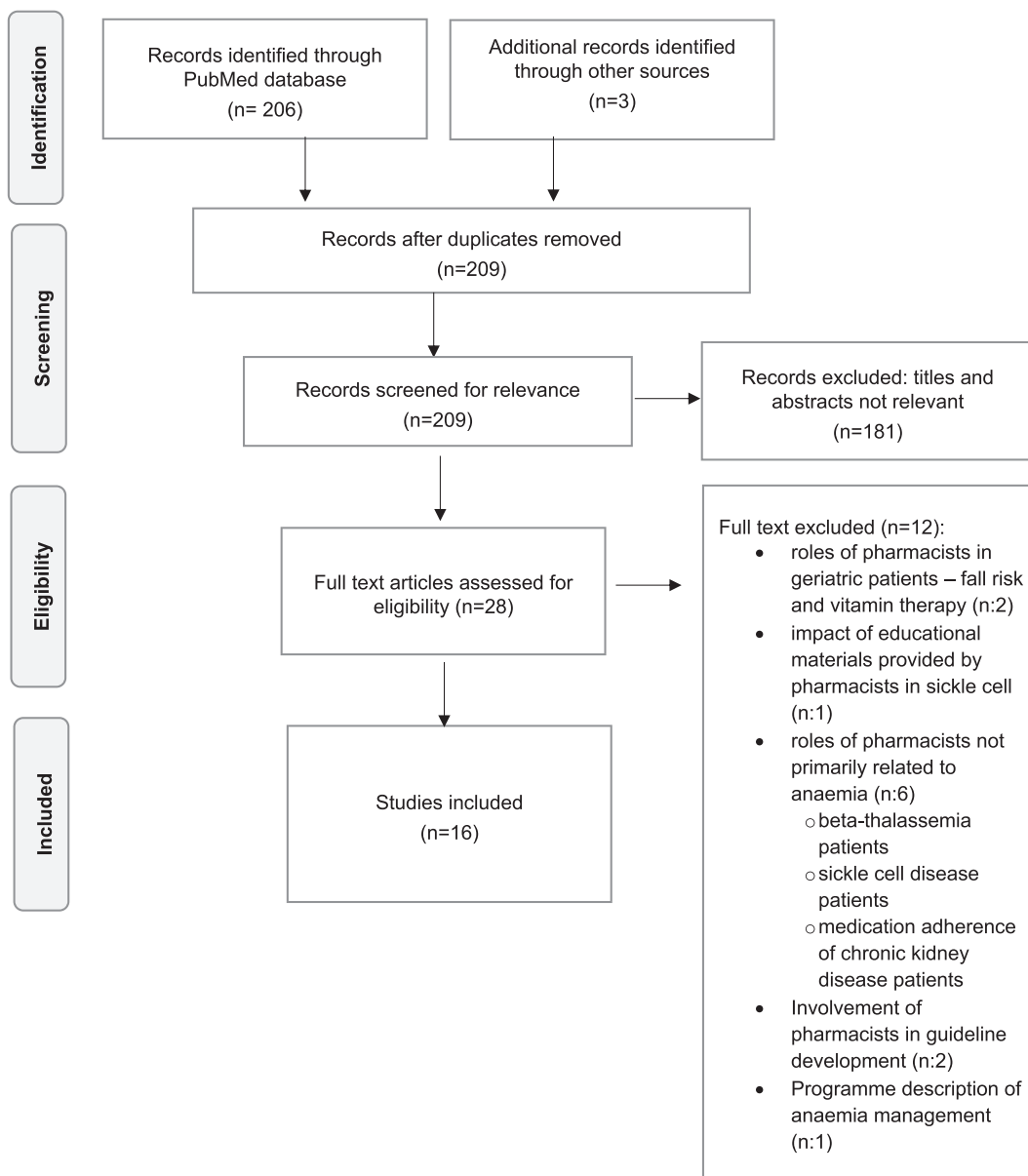


Fig. 1. PRISMA chart.

Introduction and welcome by facilitator and introducing of moderator
 Facilitator set a scene to provide the aims of the discussion
 The questions asked during the session were:

- 1) In your practice, how common/often do you see patients with iron-deficiency anaemia?
- 2) Thinking generally as a profession in your country, how would you describe the pharmacist's roles in this topic in your country? How do you see the roles of pharmacists in this topic developing/expanding in the future?
- 3) Are you aware of any current national initiatives related to the roles of pharmacists in iron deficiency anaemia?
- 4) What skills and knowledge (competencies) do pharmacists require to support their roles in managing patients with iron-deficiency anaemia?
- 5) Are there any education and training programmes or tools available in your country to support the pharmacist's roles in this topic?
- 6) What are the barriers and enablers to expanding or developing the pharmacists' roles in this area?

Fig. 2. Content of topic guide.

continuous ambulatory peritoneal disease patients,³⁹ and in iron deficiency anaemia.³⁸ Two articles utilised before-after design, one of the articles evaluating the impact of pharmacists after providing an educational training programme for patients,³⁶ and the other article was a pre-post evaluation of training implementation to support pharmacists in providing point-of-care testing, including anaemia.⁴¹ Two articles utilised mixed methods approaches such as a combination of simulated clients,^{40,42} interviews,^{40,42} focus group discussions,⁴⁰ governmental medicine record reviews,⁴² and patient observation.⁴²

The demographics of the patient population explored in the included articles were pre-dialysis patients,³⁰ patients with continuous ambulatory peritoneal dialysis,³⁹ outpatient haemodialysis patients,^{28,33,34,37} patients with chemotherapy-induced anaemia who received erythropoietin-stimulating agents,^{29,31} pregnant women,⁴⁰⁻⁴³ and patients with suspected iron deficiency anaemia.³⁸ The most common anaemias investigated in the included articles were renal anaemia (n:8),^{28,30,33-37,39} followed by pregnancy-related anaemia (n:4),⁴⁰⁻⁴³ iron deficiency anaemia (n:4),^{32,38,41,43} and chemotherapy-induced anaemia (n:2).^{29,31} Three studies described pharmacy-led anaemia clinics in renal anaemia management.^{29,30,36}

The topics of included articles were varied. Ten included articles described the positive impact of having pharmacists in anaemia management,^{29,32-39,43} in which four of them investigated the impact of implementing pharmaceutical care education programmes in the community setting,⁴³ in a hospital,³⁹ and in the haemodialysis settings.^{34,37} Eight articles investigated pharmacists' roles in the therapy management of anaemia in chronic kidney disease patients and how the involvement of pharmacists can bring potential clinical^{28,33,36,37,39} and economic^{29,31,42} benefits. Two articles explored how pharmacists' involvement and collaborative agreement with other healthcare professionals had an impact on the decreased cost of therapy in the management of anaemia in patients with malignant disease who took erythropoiesis-stimulating agents.^{29,31} Other topics explored in the included articles are related to assessing the knowledge and behaviour of drug stores staff regarding pregnancy-related

anaemia,⁴⁰ feasibility and acceptability evaluation of pharmacy worker training to provide point-of-care testing in community pharmacies,⁴¹ and to evaluate the accessibility of community pharmacy in providing iron supplements for maternal anaemia.⁴²

3.1.2. Existing evidence on pharmacists' roles in anaemia

The included articles describe pharmacists' roles in three broad settings: in the primary care setting, such as in a community pharmacy,⁴⁰⁻⁴² in cancer or anaemia clinics,^{29-31,36} and in hospital or outpatient clinics in the hospital.^{28,32-35,37-39,43} There were some distinct roles in a particular setting and in a particular type of anaemia described in the included articles. Fig. 3 shows the intersection of each role according to the setting and types of anaemia managed.

Pharmacists in an anaemia clinic conducted medication reconciliation by documenting an accurate list of patients' current medications and identifying any drug-related problems.²⁹ Two studies conducted in an outpatient clinic in a hospital, in Jordan³⁸ and Thailand,⁴³ investigated how clinical pharmacist interventions improved patients' outcomes through pharmaceutical care programmes where they conducted drug counselling for patients with iron deficiency anaemia. The counselling includes anaemia management, diet modification, treatment recommendation, drug administration training (such as injection), side effect management, how to address side effects and how to overcome drug-food and drug-drug interactions.^{38,43}

During their collaboration with other healthcare professionals in an outpatient clinic in a hospital, pharmacists provided recommendations to initiate iron therapy and suggested appropriate starting doses for iron supplements.³⁸ They also became a trustable source of information for others in the hospital, particularly in ensuring the appropriate administration of medications.³² In some included articles outlining pharmacists' roles in outpatient clinics in the hospitals, pharmacists recommended the dose changes of specific medicines, such as Epoetin, and administration of iron preparations according to the laboratory results.^{33-35,37} Their active

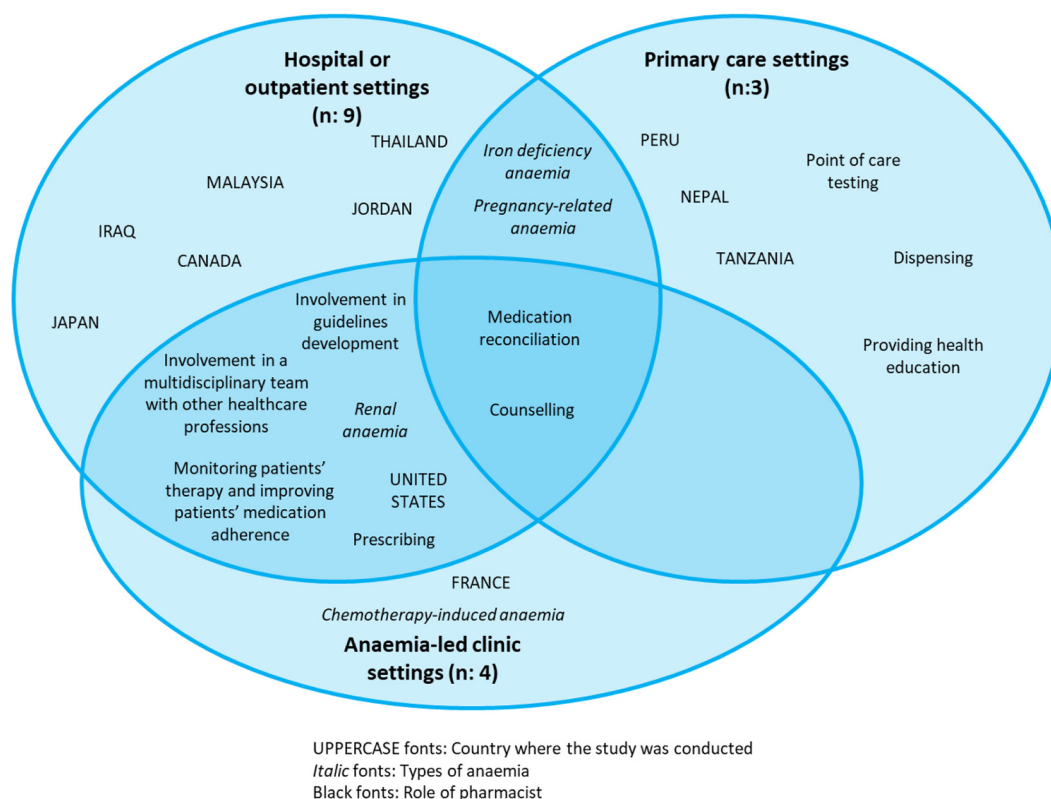


Fig. 3. Intersections of pharmacists' roles described in the literature.

participation in providing recommendations was found to have a great therapeutic impact and was accepted by other healthcare professionals.^{33,34} In other articles, the roles evolved, where they have prescribing privileges^{28,30} to initiate or discontinue specific medications,^{28,30,31} adjust the dose^{28,30,31} and order appropriate laboratory tests.^{28,30,34,39}

Pharmacists in anaemia or outpatient clinics in the hospital setting were also involved in developing evidence-based practice guidelines with other healthcare professionals.^{29,31,34} Pharmacists were ideally positioned to influence drug formulary choices and therefore improve adherence to the guideline and decrease costs related to specific medications.²⁹ Patients were monitored regularly by pharmacists in studies conducted in anaemia-led clinic settings, and this approach has demonstrated favourable impacts on clinical and economic outcomes and patient satisfaction.³⁰ Pharmacists supported in advising patients to adhere to their medications.³⁷ In France, a pharmacist-run anaemia educational programme consisted of a one-hour individual session between the pharmacist and patients with chronic renal insufficiency. It showed high-level compliance and confidence of the patient in their medications.³⁶

Three studies addressed the roles of pharmacists in iron deficiency anaemia in community settings. A study conducted in Tanzania found that private pharmacies were physically closer and more accommodating than government clinics, showing the potential roles of pharmacists in maternal iron supplementation in rural settings.⁴² It was suggested that education about current policy and anaemia treatment was needed for the public,⁴² and pharmacists contributed to providing health education to the public and society.^{40,42} One of the roles described in the community settings was related to dispensing, although it was stated that there was room for improvement in the current dispensing habits.⁴⁰ Another unique role of pharmacists in the community setting was to provide point-of-care testing services. A study in Peru evaluated the feasibility and acceptability of pharmacy workforce training to provide point-of-care testing for chronic diseases, including anaemia. It was found that almost 100% of clients (n: 371) selected pharmacy as their preferred place for point-of-care testing. Reasons included faster results, faster and better attention and better access.⁴¹ The results presented an opportunity for the pharmacy workforce to be trained to conduct early detection and screening of the disease.⁴¹

While there was a positive impact of pharmacists' roles, there was a need to confirm the impact of pharmacists in a larger sample.^{33,36,37} Three studies were conducted in single settings only,^{37–39} which affects the generalisability of the findings.^{31,37–41}

3.2. Focus group discussion

3.2.1. Participants' demographic

Twelve participants contributed to the discussion. Participants worked across a variety of settings: community (n:7); hospital (n:3), government (n:1) and academia (expert in women's health) (n:1). Their country of residence was India (n:3) Indonesia (n:2), Malaysia (n:3), Philippines (n:2) and Singapore (n:2).

3.2.2. Participants' perception of the roles of pharmacists in iron deficiency anaemia

Participants described the possibility of populations containing many people who were not aware that they were anaemic. People were usually diagnosed and recorded when the anaemia was already in a moderate or severe stage, or anaemia was a result of other diseases, such as anaemia related to chronic kidney disease. Participants perceived that one possible cause of this unawareness was a lack of knowledge of anaemia, particularly in the rural settings of a country. This was perceived as an opportunity for pharmacists to expand their roles in the provision of health education to the community and the screening and detection of anaemia.

"In my experience, iron deficiency anaemia is still undiagnosed. And if somebody gets iron deficiency, so they are already at the moderate or severe stages of the disease. So I think the screening and early detection for iron deficiency anaemia are very important, and pharmacists may be involved in these areas."

Participants listed opportunities for pharmacists' roles in the screening and detection as follows: 1) conducting medicines reconciliation, 2) noticing the anaemia symptom, 3) conducting a point-of-care haemoglobin test for those who complained of anaemia symptoms (if the services were available) or advising patients to take the test, 4) discussing possible causes of the anaemia (drug-induced, chronic underlying disease-induced) and 5) referring suspected patients to medical doctors or physicians for further investigation. All participants emphasised the roles of pharmacists in screening and detection.

"For the general population, I would have to agree that it is probably underdiagnosed, and in my chronic kidney disease anaemia clinic, we use the POCT [point of care testing] haemoglobin machine to check the patient's haemoglobin. We're able to get the finger prick and the results within seconds. If this is such a prevalent and common problem in the community, perhaps we should adopt the use of these POCT haemoglobin testing machines so that when patients come in who complain of general weakness, tiredness, lethargy, lack of appetite, poor appetite ... we can do a very quick POCT check to potentially diagnose anaemia in the general population. At least, for a start, if we find that the haemoglobin is below target, we can then refer these individuals to their GPs or their other regular physicians for further monitoring."

In addition to the role in screening and detection, participants described the pharmacists' role in the "medication therapeutic management" (MTM) of patients. MTM is a healthcare service to ensure the best therapeutic outcomes for patients which include medication therapy review, medication-related action plan, education and intervention, documentation and follow-up. Pharmacists conducted patients' histories, supported people in choosing the right supplements by looking at their dietary habits and over-the-counter medicines, and ensured appropriate medication was suggested. This was deemed important because there might be drug and food interactions with iron supplements, and there might be some supplements with a better side effect profile that are more suitable for certain people. Participants indicated that another important role of pharmacists was related to patient counselling. The patient counselling described was related to anaemia symptoms, dietary intake, drug and food interaction with iron supplements related to bioavailability and pharmacokinetics, and side effects of iron supplements. One participant observed that patient counselling needs to be tailored according to age group and disease or types of anaemia management. One growing opportunity for pharmacists' roles includes the patients monitoring and following up on their therapeutic outcomes.

Participants also shared that pharmacists supported other healthcare professions, such as nurses, in mother and child clinics where they educated them about their medications and supplied iron supplements for the clinics. The mother and child clinics encourage mothers and children to attend regular health check-ups, including anaemia screening. Participants from India described that there was currently an initiative in the country called Anaemia Mukht Bharat under the National Iron Plus Initiative,⁴⁴ where pharmacists could contribute to increasing awareness of the initiative. Opportunities to be involved more in the health policies related to anaemia and in developing a national guideline on anaemia management were deemed important.

"In India, we have guidelines for control of iron deficiency anaemia under the National Iron Plus Initiative, Anaemia Mukht Bharat, and Weekly Iron Folic Acid Supplementation. The Pharmacy Council of India encourages clinical and community pharmacists to participate in these programmes in rural areas or at primary healthcare centres."

3.2.3. Education and training needed to support pharmacists' roles in iron deficiency anaemia

Participants shared their perceptions of knowledge and skills needed in managing anaemia. They perceived pharmacists need to understand the disease, related to the aetiology and pathophysiology of anaemia, signs and symptoms, and anaemia therapy and monitoring. Four participants described the knowledge of anaemia treatment that pharmacists should possess, such as pharmacokinetics, pharmacodynamics, the bioavailability of iron supplements, the interaction of iron supplements and therapeutic choices and dietary recommendations and healthy lifestyles.

In addition to knowledge of the disease and treatment, six participants described skills needed to manage anaemia. Pharmacists should have good communication skills to conduct counselling on anaemia treatment and provide health education information to the public related to nutrition and lifestyle advice. Pharmacists' skills in undertaking patient screening were considered important to extending the role of pharmacists in community pharmacy settings. This includes taking accurate histories and performing basic physical examinations such as patients' vital signs. Additionally, pharmacists could recognise the causes of anaemia, such as medication-induced anaemia. A roundtable participant emphasised that pharmacists should be able to carry out appropriate referrals and escalation protocols, i.e., refer patients to other healthcare providers for immediate evaluation. If applicable, pharmacists can also have the capacity to order standard anaemia tests and interpret laboratory data such as haemoglobin trends.

“Before we suggest any supplements or educate the patient, we first do the assessment, starting from what are they feeling? What are the symptoms, how long [have they lasted], and what supplement medicines have they taken so far? Are there any traditional herbal medicines that they have taken too? After the assessment, then we recommend the supplement to be consumed and also educate them to maintain good nutritional intake in order to balance their daily needs.”

Four participants shared pharmacists' knowledge regarding calculating nutrition adequacy information to balance diet intake and supplements. One participant highlighted the importance of nutrition knowledge in pharmacy undergraduate curricula since she faced many anaemic patients with insufficient diets. This was also, particularly because pharmacists in the private sector need to be independent and prepared to manage patients with anaemia, so early-career pharmacists should have sufficient knowledge of nutrition.

In addition to the inclusion of nutrition in pharmacy undergraduate curricula, eight participants from all countries highlighted a need to develop toolkits or guidelines for individual pharmacists on iron deficiency anaemia. This guideline could be an accessible resource for pharmacists to guide them in screening and counselling patients. Participants also shared some insights on guidelines contents, including 1) anaemia diagnoses and severity assessment to support screening; 2) the selection of iron supplements and suitable formulation, as well as information on iron preparations, their bioavailability, and their pharmacokinetics; common side effects of medicines and supplements; and dietary guidelines. Such a training guide could assist pharmacists in their early careers in handling patients with iron deficiency anaemia. In addition to the guideline, a participant suggested a standardised checklist or flowchart to help pharmacists in patient screening, including gathering information about patients' diets, where dietary modifications could be the initial intervention before providing iron supplements. A participant also brought up the need to create a risk calculator for anaemia that could be used to grade the severity of anaemia and aid pharmacists in encouraging and educating patients to make dietary and lifestyle changes.

“FIP can give us tools like a risk calculator, which can be used for grading the severity of anaemia based on [patients'] haemoglobin level, iron level, erythropoietin hormone level, bleeding risk, disease history, history of miscarriage in pregnancy, and level of consumption of iron sources. This grade can be used as a way to evaluate therapeutic needs of patients and motivating them to comply with their treatment. The risk calculated can be based on the amount of risk that patients have and [could include] risk factors that cannot be modified.”

Four participants recommended professional programmes in the country, such as workshops, self-directed learning or continuing professional development courses related to anaemia to support competency development in addition to the tools and guidelines. This could be done in collaboration with national professional leadership bodies. A participant also highlighted the importance of monitoring the success of anaemia programmes to advocate further for pharmacists' involvement.

“Another thing that can be helpful is that if we are given a chance to establish programmes to support the anaemia management community, it's also important to look at monitoring outcomes.... How often should these patients be followed up in the community? And then, of course, the resolution of anaemia [should be assessed] when such a programme is actually established in the community.”

3.2.4. Barriers and enablers to expanding or developing pharmacists' roles in iron deficiency anaemia

The availability of patients' medical records from a young age was perceived as one of the enablers in developing pharmacists' roles in anaemia. Collaboration between pharmacists and patients in completing patients' personal medication records was important. This will also support pharmacists' role in monitoring patients with anaemia in the community setting. Two participants also shared that collaboration with other healthcare professionals was another area that was still lacking and could be one of the enablers in developing pharmacists' roles. For instance, pharmacists' involvement in patient screening in the community may be supported if physicians encourage pharmacists to do so. A participant stated that by emphasising to primary care physicians the importance of pharmacists in iron deficiency anaemia, community pharmacies might become an accessible, initial point of contact for patient screening; this will then follow by a partnership with physicians for patient referral. In addition, pharmacists could also supply iron supplements under an agreed protocol.

“One area that's perhaps still lacking is fostering collaboration with physicians. I don't know how we're going to do this, but maybe it is, again, highlighting to the physician community in our respective countries what pharmacists can do. What we're capable of doing. What can we do as a first-line or first-responder? Being the first touch point for a lot of our community or patients. And then let there be some type of collaboration for referral of suitable patients, and if there should be escalation to the physicians for a more serious problem. Some type of partnership with GPs.”

Participants identified a number of obstacles, including a lack of recognition of the role of pharmacists in their countries, a lack of pharmacists' participation in government initiatives aimed at lowering anaemia prevalence, and a lack of funding remuneration to equip community pharmacies with point-of-care testing machines to detect anaemia early.

“If we can request funding, and if we feel that the POCT machines are going to be useful, then we should start to equip our community pharmacies with one such machine at every store so that we can do early detection of anaemia and the necessary follow up.”

4. Discussion

This paper has explored existing literature and subsequently explored the pharmacists' roles in iron deficiency anaemia, one of the most prevalent causes of anaemia, in a focus group discussion. The literature review described the pharmacist's roles in anaemia ranging from patient management and monitoring, collaboration with other healthcare professionals and involvement in the development of guidelines. The roles were different according to the settings. For example, pharmacists had prescribing privileges in hospital and anaemia-led clinic settings.^{28,30} Another example is the unique role of pharmacists in the community setting, which was a place of maternal health point-of-care testing.⁴¹ Studies have shown the potential health and financial benefits of performing pharmacy-based testing services,^{45,46} particularly in low and middle-income countries (LMICs) where there may be insufficient health workforce capacity and limited access to healthcare services.⁴⁷ The findings from the focus group discussion corroborated the literature review findings and suggested opportunities for pharmacists to contribute to iron deficiency management, particularly with the expansion of service delivery in community pharmacies as an accessible place for point-of-care testing.

The findings also informed a possible opportunity for pharmacists' roles in the health education provided to the community. Increasing public knowledge of the effects and prevalence of iron deficiency anaemia can help with its early diagnosis and treatment.⁴⁸ Moreover, the findings highlighted pharmacists' roles in anaemia counselling and monitoring in relation to patients' adherence. Side effects of iron supplements can impact patients' adherence, which was previously reported in a study conducted in Malaysia.⁴⁹ A study conducted in Saudi Arabia on community pharmacists' perception of barriers provision of anaemia management also found that patients' lack of awareness regarding anaemia, health attitudes, and time constraints were the most frequent barriers to anaemia counselling.⁵⁰

Therefore, community pharmacists play a vital role in patient education and health education provision to society. Further research could be conducted to explore pharmacists' roles and impact on anaemia management in the community setting.

This study suggests a need to provide educational support for pharmacists through guidelines or toolkits for anaemia screening, counselling and management accompanied by training or workshops. This finding is in line with the results of the literature review, in which for potential improvement of practice, there was a need to train pharmacists to improve the history taking of medicines, dispensing and advice and referral in anaemia.⁴⁰ Another study showed that an anaemia educational care programme was needed to increase pharmacists' knowledge and understanding of anaemia and to cover specific patients' counselling points.⁵⁰ This finding further supports the recommendation provided by the FIP in its statement of policy on the role of pharmacy professionals in point-of-care testing, where pharmacists should be supported with education and training at undergraduate and continuous professional development levels to ensure they are competent to perform point of care testing in disease screening.⁴⁷ National professional leadership bodies are encouraged to develop practice support guidance and resources for their members.⁴⁷

One of the enablers highlighted in this study was a collaboration with other healthcare professionals, for example, physicians, in relation to developing community-based point-of-care testing. This finding is consistent with other research, which found that interprofessional relationships are critical to anaemia management.^{50,51} The literature review also validated the importance of this relationship in anaemia-led clinics through collaborative practice agreements between physicians and pharmacists.³¹ Further research might explore the implementation of the collaborative practice agreement and its impact on anaemia management in community settings.

Further research might also investigate the outcomes and cost-effectiveness of pharmaceutical care services in community settings for anaemia. Monitoring and evaluating how pharmaceutical care services could resolve anaemia challenges and contribute to the WHO global target in anaemia could be useful in advocating for expanding and recognising the pharmacists' roles in this area. In addition, monitoring and evaluating services help practitioners to learn from prior experience, make data-driven decisions, and lead and adjust activities based on intended results.⁵²

This study offers insight into opportunities to expand pharmacists' roles in iron deficiency anaemia, including educational and training needs. Limitations may include the scope of the study where it is only based on a systematic search of one database and one focus group. In addition, in the systematic search, only the mesh terms were used which may result in a limited number of eligible studies retrieved for the review. However, the focus group discussion results corroborated the literature review findings. The nature of the sample selection, which was a purposive sample, limits the generalisability of the findings; however, the sample selected was advised by the professional leadership bodies in the country, which may have expertise and experience in the topic. In addition, respondent validation, where participants were invited to comment on the final themes of findings, confirmed the findings.

5. Conclusion

This paper has presented pharmacists' roles in anaemia, particularly their roles in iron deficiency anaemia and the education and training needed to support this. There is a growing opportunity for pharmacists to contribute to achieving the WHO global targets on anaemia, where pharmacists can support screening and managing anaemia and providing health education to the patients and community. The findings from this study provide fruitful opportunities for further work, such as the introduction of pharmacy based testing services, prescribing rights for diagnosing anaemia, public health campaigns through community pharmacies and collaborative practice arrangements in place with anaemia-led clinics. In addition to developing comprehensive guidelines and toolkits, national professional leadership organisations may develop programmes for continuing education on anaemia to support the development of pharmacists' competencies up to

advanced level practice. It is also imperative to monitor the success and outcomes of pharmacists' involvement in reducing the prevalence of anaemia and supporting the achievement of the WHO global targets on anaemia.

Funding

The focus group discussion was supported by unrestricted funds from Procter & Gamble Health.

Author contributions

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This work was supported and resourced by International Pharmaceutical Federation (FIP). The authors would like to thank all participants who contributed to the focus group discussion. The authors thank member organisations who supported the participants' recruitment and the FIP Programme Team members and FIP Regional Engagement, Support and Development Manager and FIP Community Pharmacy Section for their support in organising the focus group discussion. The focus group discussion was supported by unrestricted funds from Procter & Gamble Health. The authors would like to thank: Jass Liew for her support.

References

1. World Health Organization (WHO). Global nutrition targets 2025: Anaemia policy brief. World Health Organization. Accessed 27 January 2023. <https://www.who.int/publications/i/item/WHO-NMH-NHD-14.4>.
2. World Health Organization (WHO). Anaemia. World Health Organization. Accessed 27 January 2023. https://www.who.int/health-topics/anaemia#tab=tab_1.
3. Owais A, Merritt C, Lee C, Bhutta ZA. Anemia among women of reproductive age: an overview of global burden, trends, determinants, and drivers of progress in low- and middle-income countries. *Nutrients* 2021;13(8):2745. <https://doi.org/10.3390/nu13082745>.
4. Levy A, Fraser D, Katz M, Mazor M, Sheiner E. Maternal anemia during pregnancy is an independent risk factor for low birthweight and preterm delivery. *Eur J Obstet Gynecol* 2005;122(2):182–186. <https://doi.org/10.1016/j.ejogrb.2005.02.015>.
5. Banhidly F, Acs N, Puho EH, Czeizel AE. Iron deficiency anemia: pregnancy outcomes with or without iron supplementation. *Nutr* 2011;27(1):65–72. <https://doi.org/10.1016/j.nut.2009.12.005>.
6. Figueiredo A, Gomes-Filho IS, Batista JET, et al. Maternal anemia and birth weight: a prospective cohort study. *PLoS One* 2019;14(3):e0212817. <https://doi.org/10.1371/journal.pone.0212817>.
7. Abu-Ouf NM, Jan MM. The impact of maternal iron deficiency and iron deficiency anemia on child's health. *Saudi Med J* 2015;36(2):146–149. <https://doi.org/10.15537/smj.2015.2.10289>.
8. Mawani M, Ali SA, Bano G, Ali SA. Iron deficiency anemia among women of reproductive age, an important public health problem: situation analysis. *Reprod Syst Sex Disord* 2016;5(3):1–6. <https://doi.org/10.4172/2161-038X.1000187>.
9. Saloojee H, Pettifor JM. Iron deficiency and impaired child development. *BMJ* 2001;323(7326):1377–1378. <https://doi.org/10.1136/bmj.323.7326.1377>.
10. Grantham-McGregor S, Ani C. A review of studies on the effect of iron deficiency on cognitive development in children. *J Nutr* 2001;131(2):649S–668S. <https://doi.org/10.1093/jn/131.2.649S>.
11. Alderman H, Horton S. The economics of addressing nutritional anemia. *Nutr Anemia* 2007;19:35. <https://doi.org/10.52439/UDV4271>.

12. Haas JD, Brownlie T. Iron deficiency and reduced work capacity: a critical review of the research to determine a causal relationship. *J Nutr* 2001;131(2):676S–690S. <https://doi.org/10.1093/jn/131.2.676S>.
13. UNGA. Global indicator framework for the sustainable development goals and targets of the 2030 agenda for sustainable development. Accessed 27 January 2023. https://unstats.un.org/sdgs/indicators/Global%20Indicator%20Framework%20after%202020%20review_Eng.pdf.
14. Stevens GA, Paciorek CJ, Flores-Urrutia MC, et al. National, regional, and global estimates of anaemia by severity in women and children for 2000–19: a pooled analysis of population-representative data. *Lancet Glob Health* 2022;10(5):e627–e639. [https://doi.org/10.1016/S2214-109X\(22\)00084-5](https://doi.org/10.1016/S2214-109X(22)00084-5).
15. Kinyoki D, Osgood-Zimmerman AE, Bhattacharjee NV, Kassebaum NJ, Hay SI. Anemia prevalence in women of reproductive age in low- and middle-income countries between 2000 and 2018. *Nat Med* 2021;27(10):1761–1782. <https://doi.org/10.1038/s41591-021-01498-0>.
16. World Health Organization (WHO). Global anaemia reduction efforts among women of reproductive age: impact, achievement of targets and the way forward for optimizing efforts. World Health Organization. Accessed 27 January 2023. <https://apps.who.int/iris/rest/bitstreams/1315161/retrieve>.
17. World Health Organization (WHO). Guideline: Daily iron supplementation in adult women and adolescent girls. World Health Organization. Accessed 27 January 2023. https://apps.who.int/iris/bitstream/handle/10665/204761/9789241510196_eng.pdf?sequence=1&isAllowed=y.
18. Pasricha S-R, Tye-Din J, Muckenthaler MU, Swinkels DW. Iron deficiency. *Lancet* 2020;397(10270):233–248.
19. GBD 2016 disease and injury incidence and prevalence collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990–2016: a systematic analysis for the global burden of disease study 2016. *Lancet* 2017;390(10100):1211–1259. [https://doi.org/10.1016/S0140-6736\(17\)32154-2](https://doi.org/10.1016/S0140-6736(17)32154-2).
20. Patwardhan A, Duncan I, Murphy P, Pegus C. The value of pharmacists in health care. *Popul Health Manag* 2012;15(3):157–162. <https://doi.org/10.1089/pop.2011.0030>.
21. International Pharmaceutical Federation (FIP). *Nutrition and weight management services: a toolkit for pharmacists*. The Hague: International Pharmaceutical Federation. 2021.
22. Duggan C. Advancing the workforce to meet the primary health care agenda: Pharmacy's contribution to universal health coverage. *Int J Pharm Pract* 2020;28(2):118–120. <https://doi.org/10.1111/ijpp.12579>.
23. Ramu B, Saibaba SV. Role of community pharmacist in management of anaemia. *Pharm Pharmacol Int* 2018;6(3):216–220. <https://doi.org/10.15406/ppij.2018.06.00178>.
24. Gilmartin C. Pharmacist's role in managing anemia in patients with chronic kidney disease: potential clinical and economic benefits. *Am J Health Syst Pharm* 2007;64(13 Suppl 8). <https://doi.org/10.2146/ajhp070183.S15-22; quiz S23-5>.
25. International Pharmaceutical Federation (FIP). *We are FIP*. The Hague: International Pharmaceutical Federation. 2022. Accessed 27 January 2023. <https://www.fip.org/>.
26. International Pharmaceutical Federation (FIP). *Global pharmaceutical observatory: Our work*. The Hague: International Pharmaceutical Federation. 2022. Accessed 27 January 2023. <https://gpo.fip.org/our-work/2/>.
27. Braun V, Clarke V. Reflecting on reflexive thematic analysis. *Qual Res Sport Exerc Health* 2019;11(4):589–597. <https://doi.org/10.1080/2159676X.2019.1628806>.
28. To LL, Stoner CP, Stolley SN, Buenviaje JD, Ziegler TW. Effectiveness of a pharmacist-implemented anemia management protocol in an outpatient hemodialysis unit. *Am J Health Syst Pharm* 2001;58(21):2061–2065. <https://doi.org/10.1093/ajhp/58.21.2061>.
29. Gilreath JA, Sageser DS, Jorgenson JA, Rodgers GM. Establishing an anemia clinic for optimal erythropoietic-stimulating agent use in hematology-oncology patients. *J Natl Compr Canc Netw* 2008;6(6):577–584. <https://doi.org/10.6004/jncn.2008.0044>.
30. Debenito JM, Billups SJ, Tran TS, Price LC. Impact of a clinical pharmacy anemia management service on adherence to monitoring guidelines, clinical outcomes, and medication utilization. *J Manag Care Spec* 2014;20(7):715–720. <https://doi.org/10.18553/jmcp.2014.20.7.715>.
31. Weil E, Oxencis C. Pharmacist collaborative practice agreement for the management of anemia in malignant disease with erythropoiesis-stimulating agents. *Support Cancer Ther* 2015;23(8):2507–2513. <https://doi.org/10.1007/s00520-015-2745-2>.
32. Wall G, Sharma V, Taylor MJ, et al. Retrospective safety evaluation of a pharmacist-assisted total dose iron sucrose protocol in hospital inpatients with iron deficiency anemia. *J Pharm Pract* 2021;34(4):573–576. <https://doi.org/10.1177/0897190019885239>.
33. Ohnishi J, Miyake A, Kuwatsuka K, et al. Effect of pharmacist management on serum hemoglobin levels with renal anemia in hemodialysis outpatients. *Biol Pharm Bull* 2011;34(10):1609–1612. <https://doi.org/10.1248/bpb.34.1609>.
34. Kimura T, Arai M, Masuda H, Kawabata A. Impact of a pharmacist-implemented anemia management in outpatients with end-stage renal disease in Japan. *Biol Pharm Bull* 2004;27(11):1831–1833. <https://doi.org/10.1248/bpb.27.1831>.
35. Nekidy WSE, Kadri A, John TJL-S, Ghazi IM, Soong DC. Role of nephrology pharmacists in the management of anemia in outpatient dialysis units: a Canadian model. *Clin Nephrol* 2020;94(1):36–42.
36. Allenet B, Chen C, Romanet T, Viallet P, Calop J. Assessing a pharmacist-run anaemia educational programme for patients with chronic renal insufficiency. *Pharm World Sci* 2007;29(1):7–11. <https://doi.org/10.1007/s11096-005-4800-4>.
37. Marouf BH, Yusif IA, Najim RH. Role of pharmacist intervention in the management of anemia associated with chronic kidney diseases at the hemodialysis setting. *J Young Pharm* 2020;12(2):162–168. <https://doi.org/10.5530/jyp.2020.12.33>.
38. Tahaine LM, Khasawneh AH. A randomised control trial to evaluate the clinical pharmacist's role in managing iron deficiency anaemia patients. *Int J Pharm Pract* 2018;26(1):55–62. <https://doi.org/10.1111/ijpp.12358>.
39. Fong CW, Sattar MZ, Mamat NKM, Tnita Kadir, Mokhtar WNW, Harun Z. The effect of pharmacist's interventions on anaemia management among continuous ambulatory peritoneal dialysis patients in Terengganu tertiary hospital. *Malays J Pharm* 2021;43–48.
40. Kafle KK, Madden JM, Shrestha AD, et al. Can licensed drug sellers contribute to safe motherhood? A survey of the treatment of pregnancy-related anaemia in Nepal. *Soc Sci Med* 1996;42(11):1577–1588. [https://doi.org/10.1016/0277-9536\(95\)00294-4](https://doi.org/10.1016/0277-9536(95)00294-4).
41. Saldarriaga EM, Vodicka E, La Rosa S, Valderrama M, Garcia PJ. Point-of-care testing for anemia, diabetes, and hypertension: a pharmacy-based model in Lima, Peru. *Ann Glob Health* 2017;83(2):394–404. <https://doi.org/10.1016/j.aogh.2017.03.514>.
42. Young S, Ali SM, Beckham S. The potential role of private pharmacies in maternal iron supplementation in rural Tanzania. *Food Nutr Bull* 2009;30(1):16–23. <https://doi.org/10.1177/156482650903000102>.
43. Sirisopa N, Pongchaidecha M. Evaluation of a pharmaceutical care program with pregnant women with iron deficiency anemia. *J Sci Educ Technol* 2015;17(2):53–62.
44. Government of India. Anemia Mukh Bharat. Accessed 27 January 2023. <https://anemia.muktbharat.info/>.
45. Buss VH, Deeks LS, Shield A, Kosari S, Naunton M. Analytical quality and effectiveness of point-of-care testing in community pharmacies: a systematic literature review. *Res Social Adm Pharm* 2019;15(5):483–495. <https://doi.org/10.1016/j.sapharm.2018.07.013>.
46. Lingervelder D, Koffijberg H, Kusters R, MJ JJ. Health economic evidence of point-of-care testing: a systematic review. *Pharmacoecon Open* 2021;5(2):157–173. <https://doi.org/10.1007/s41669-020-00248-1>.
47. International Pharmaceutical Federation (FIP). *FIP statement of policy on the role of pharmacy in point of care testing*. The Hague: International Pharmaceutical Federation. 2022.
48. Cappellini MD, Musallam KM, Taher AT. Iron deficiency anaemia revisited. *J Intern Med* 2020;287(2):153–170. <https://doi.org/10.1111/joim.13004>.
49. Abd Rahman R, Idris IB, Isa ZM, Rahman RA, Mahdy ZA. The prevalence and risk factors of iron deficiency anemia among pregnant women in Malaysia: a systematic review. *Front Nutr* 2022;9:847693. <https://doi.org/10.3389/fnut.2022.847693>.
50. Madkhali OA, Alzahrani F. Community pharmacists' perceptions of their role in provision of anemia management in Jazan region, Saudi Arabia, and the associated barriers. *Healthcare (Basel)* 2022;10(8). <https://doi.org/10.3390/healthcare10081452>.
51. Kritikos VS, Reddel HK, Bosnic-Anticevich SZ. Pharmacists' perceptions of their role in asthma management and barriers to the provision of asthma services. *Int J Pharm Pract* 2010;18(4):209–216. <https://doi.org/10.1111/j.2042-7174.2010.00040.x>.
52. World Health Organization (WHO). Nutritional anaemias: tools for effective prevention and control. World Health Organization. Accessed 27 January 2023. <https://www.who.int/publications/i/item/9789241513067>.