Quality assurance and iron deficiency in Egypt

WALID A. ABUBAKER1, A.F. AL-ASSAF2 AND VICKI L. CLEAVER3

1Technical Advisor, United Nations, Jericho, Palestine Authority, 2Department of Health Administration and 3Department of Health Promotions Sciences, College of Public Health, University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA

Abstract

Objective. To develop an intervention in rural Egypt to address the problem of iron deficiency anemia and to demonstrate the effectiveness of applying quality assurance (QA) methods in combating this.

Design. Assessment of an intervention study utilizing QA methods.

Setting. Rural primary care clinics in Egypt.

Study Participants. One hundred and eighty pregnant mothers (and their 180 children) were randomly selected at two clinic sites from all those who were diagnosed as having an iron deficiency disorder.

Intervention. Multi-disciplinary teams were formed to develop and deliver health promotional approaches related to iron deficiency to the study participants. By using QA techniques the teams were able to strengthen local capacity and participant compliance to the educational messages.

Main outcome measures. Pre- and post-measurements of client satisfaction, results of hemoglobin lab tests, and the extent of retention of nutritional messages by the participants.

Results. Eighty percent of the study population demonstrated satisfactory knowledge of the nutritional messages. There was a 75% improvement of client satisfaction with the clinic and an effective follow-up system of care was designed and implemented successfully for each clinic. On average, the number of children aged less than 5 years diagnosed with an iron deficiency disorder decreased from 37% to 5%. Similar success was achieved with the pregnant mothers: the prevalence of iron deficiency anemia was reduced from 100% to only 14%.

Conclusions. The use of QA process improvement techniques was extremely effective in reducing iron deficiency anemia among the target population. There is an increasing need to include quality methods in micronutrient intervention techniques.

Keywords: iron deficiency anemia, micronutrients, process improvement team, quality assurance

The World Bank estimates that almost one-half of the world's population suffers from malnutrition and that two billion people may develop disease related to deficiencies in iron, iodine, or vitamin A. These deficiencies (hidden hunger) predominantly affect women, infants and children in developing countries and affect their intellectual and physical development [1]. The 1994 World Bank's World Development Report also suggests that programs against micronutrient deficiencies are among the most cost-effective, costing less than US$50 per disability-adjusted life year gained. According to a World Health Organisation (WHO) report, as many as one in five maternal deaths are attributed to severe iron deficiency; this impact extends further to children because 30% of them entering the hospital with iron deficiency die if they do not receive a blood transfusion in time. Again, according to the same report, the WHO estimates that more than two billion people are at risk from micronutrient deficiency worldwide; these are concentrated mainly in the developing countries. Iron deficiency is by far the most common of all deficiencies [1].

A number of donor organizations, including US Agency for International Development (USAID), WHO and the World Bank have placed the control of micronutrient deficiencies as one of their top priorities. Millions of dollars have already been spent on securing the availability of foods and micronutrients to the target populations. There has been, in recent years, an expansion of programs related to the allocation of resources for essential supplies, logistics, training

Address correspondence to A. F. Al-Assaf, College of Public Health, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, OK 73118, USA. Tel: +1 405 271 2114. Fax: +1 405 271 1868. E-mail: al-assaf@uokhsc.edu

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and other input measures in order to control the extent of micronutrient deficiencies. Yet, the desired goals are still far from being achieved in a majority of these programs [1]. The challenge, according to the USAID's funded Quality Assurance Project (QAP), lies in delivering services to at-risk communities in an efficient, equitable and sustainable manner. Effectiveness and technical competence are also requirements for ensuring a positive impact of such programs. In other words, the focus is shifting to quality in the processes of acquiring, distributing, delivering, and monitoring impact of micronutrients to the target population.

In April 1994, a Quality Assurance (QA) micronutrient partnership project was launched between QAP and the Egyptian Ministry of Health (MOH) at two sites, Al Fayoum and Qena (in the south of Egypt). Both of these remote sites are primarily rural in nature and the inhabitants are predominantly farmers with low income levels and correspondingly a lower level of education than the average Egyptian citizen. The purpose of this project, which uses education and other health promotion approaches, was to combat nutritional anemia caused by iron deficiency, particularly among pregnant women and children under 5 years of age.

QAP’s approach focuses on strengthening local capacity by institutionalizing QA mechanisms within existing health systems in the two sites. This is achieved by establishing QA units at the central, governorate, and district levels, by hiring a local expert and by focused training and technical assistance in the tools and techniques of quality assurance [1,2].

Iron deficiency anemia

Poor eating habits play a major role in the development of the iron deficiency anemia that is an important indicator of poor health status [3]. Children and adolescents are at an increased risk of developing iron deficiency anemia because of their increased demand for iron during growth and puberty. People of low socioeconomic status with less education are also at an increased risk of having iron deficiency anemia and related health conditions. In most cases, affected individuals remain undiagnosed because of infrequent visits to the health clinics and lack of screening for the detection of anemia. High birth rate, poor nutrition, associated severe health conditions and diseases such as malnourishment, tuberculosis, diarrheal diseases, respiratory and gastro-intestinal tract infections, parasitic infestation, and protein-energy malnutrition are other common causes of iron deficiency anemia. Therefore, to identify the clients who may not be getting enough iron in their diet the following three dimensions need to be assessed:

- the diet: a simple check of whether the woman or child eats regular meals, and regular portions of iron-rich foods (red meat, chicken, fish);
- the social and physical factors: ask if the woman or child has a lifestyle, or socioeconomic or physical situation with a higher than average risk of poor nutrition,
- poverty, depression, infirmity, lack of adequate teeth, etc.;
- demographics: ask if they belong to an age, sex and ethnic group that is more likely to consume inadequate dietary iron in relation to their need – the elderly, women of reproductive age (particularly those who have already had children), and teenagers.

The more risk factors that an individual has, the higher the risk of iron deficiency anemia. Therefore, to make a preventive approach work, the key is to focus on those patients who have more than one risk factor present at one time. In the multiple risk-factor patient (this includes most Egyptian women and infants) a diagnosis of iron deficiency should at least be considered (Figure 1). In Egypt, particularly in rural areas, the prevalence of iron deficiency anemia is relatively high. According to a 1993 study by the Egyptian Nutrition Institute [4], the prevalence of iron deficiency anemia was between 22 and 30% in rural population groups. The study also found that the population groups that were primarily affected were the children under 5 years of age and pregnant and lactating women. It is believed that one of the major causes of such a high prevalence rate is insufficient iron intake.

Similar work in other countries also found that in the majority of cases, children under 5 years of age and pregnant women in developing countries are the sufferers. The United Nations International Children's Emergency Fund estimated that there are about 40 million children around the world who remain in these high risk conditions [5]. It is notable that there is a correlation between poverty and health behaviors: social deprivation leads to the deterioration of one's health condition. On the other hand, culture defines the reality and therefore determines human behavior through shaping personal perception. Wellness is the integration of the components of health into a dynamic approach to optimal health that centers upon individuals taking responsibility for their health through appropriate lifestyle choices. Therefore, to maximize opportunities for better health and wellness, we need to understand how human behavior works in a specific
community, setting, or country in order to design the most appropriate interventions to improve lifestyle choices.

As mentioned earlier, in most of the developing countries, iron deficiency anemia in pregnant women and children under 5 years of age is prevalent in Egypt. Due to cultural differences, women usually take an inactive role in wage earning and are usually considered less important than their male counterparts. One example of this difference occurs at mealtime in the family. Traditionally, a good portion of the meal is offered to the member of the family who is the primary wage-earner or to the male. The women usually eat the remaining food which may not have all the nutrients required for them. Because of the women’s generally inadequate knowledge of nutritional value of various foods, they are not able to make healthy meal plans or to practice healthy cooking of food. In addition, in many instances availability of food may be scarce. Repeated childbirth, the presence of chronic diseases, and parasitic infestation may also contribute to causes of iron deficiency anemia in Egypt. Poverty and lack of education in health promotion activities are the main reasons for not attending health clinics regularly or not participating in screening tests for the detection of anemia. All of these factors contribute to a negative health status for women and children in Egypt.

**Methods**

Nutritional anemia is usually treatable and preventable. Iron in the diet is present as heme iron (in animal flesh) and inorganic iron (in vegetables). The absorption of heme is substantially better than that of inorganic iron. Therefore, assessing the diet requires looking at both the amount of iron present and the form that it is in. Absorption of non-heme iron is improved by at least 50% if vitamin C is consumed at the same meal. Tea, coffee and a certain type of fiber, all prevalent in the average Egyptian diet, can inhibit the absorption of iron. In the two clinic sites studied, health care workers were trained to instruct the women to include fruits and vegetables high in vitamin C with meat in their diets. Women were taught improved cooking methods, such as how to prevent vitamin loss, not to overboil foods, or to use the vegetable or meat stock in stews or gravies. They were taught about providing balanced meals and about receiving adequate portions of iron-rich foods.

In children, the most likely cause of iron deficiency is an inadequate amount of iron in the diet, coupled with the extra requirement for iron because of growth. Of particular importance is the fact that iron deficiency in children can adversely affect cognitive and psychomotor development during the vulnerable periods such as the toddler years. For these reasons, it is imperative that children with iron deficiency are detected and treated at an early stage [6].

In December 1993, the QAP sponsored an awareness/advocacy QA workshop for central MOH senior health officials and other interested participants [7]. Soon after that, a QA operational structure was installed, including a Central QA Micronutrient Board and QA Committees at the governorate level as well as district-level Process Improvement Teams (PITs). A number of PIT members received training in problem-solving techniques and quality improvement methods and tools. Team members were trained in the use and application of cause-and-effect diagrams, flow-charting, brainstorming and data collection, etc.

Process improvement teams are important to the reduction of iron deficiency anemia in various communities in Egypt. Involving key leaders of the community in the development of PIT’s is an important aspect of social intervention; community-based, long-term services and family support are integral parts of social intervention. Good health practices must be ensured in the community settings together with clinic-based services, so that people are encouraged to learn actively. The PIT teams developed an information system to track iron deficiencies and to monitor the quality of services provided to pregnant women and children aged under 5 years. The teams developed three data collection instruments that are now used on a monthly basis.

The first instrument is the most significant one, and measures well-defined processes and subprocesses in service delivery and support activities. This instrument is used to record observations related to three distinct components of any system: inputs (human and physical resources); processes (activities); and outcomes (results). The QAP has been using this input–process–outcome methodology as a ‘system model’ to focus on the processes and to understand the changes resulting from QA interventions [8]. This model is based on widely-accepted core principles of quality management and is adapted to a specific country’s health care system. This instrument records all of the elements of each of these components in an effort to identify all the pieces of the system (Figure 2). The second data collection instrument measures outcome factors such as the results of hemoglobin laboratory tests. The selected QA team members collect the laboratory results of the women in the sample and this information is used as proxy base-line data to measure the impact of intervention. The third instrument is used during monitoring visits by team members and includes documentation of finalized problem statements, follow-up actions taken, and observations by supervisors. This instrument documents changes other than hemoglobin changes that may support the concept of iron deficiency disorder (IDD) treatment. This documentation is based on personal interviews of these women by the team members and includes the information-related knowledge of women about diet messages, treatment courses of iron therapy and other supplements given to all pregnant women at the two clinics.

The PITs actively involved respected women and health care professionals from the community in the planning process; by doing this, the participants took ownership of the project. The individuals recruited were provided training sessions by nutritionists and medical professionals to become health workers in the clinics. The training sessions provided information to improve knowledge concerning nutritional value of foods, supplemental nutrition requirements, food composition, proper cooking methods, menu planning skills.
Iron Deficiency Disorder
Micronutrient Program/Egypt
QAP System Model

<table>
<thead>
<tr>
<th>Input</th>
<th>Process</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>✅ Reception &amp; waiting area</td>
<td>✅ History taking</td>
<td>✅ Client/staff satisfaction</td>
</tr>
<tr>
<td>✅ Registration</td>
<td>✅ Physical examination</td>
<td>✅ Skilled staff in QA &amp; data analysis</td>
</tr>
<tr>
<td>✅ Appointment book for</td>
<td>✅ Laboratory examination</td>
<td>✅ Drop-out decrease</td>
</tr>
<tr>
<td>outreach</td>
<td>✅ Treatment</td>
<td>✅ Increased availability of iron tablets</td>
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<tr>
<td>✅ Iron stock</td>
<td>✅ Counseling</td>
<td>✅ Nutritional messages delivered</td>
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<tr>
<td>✅ Educational materials</td>
<td>✅ Follow up</td>
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<td>✅ Supervision</td>
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**Figure 2** Iron deficiency disorder micronutrient program. The Egypt QAP system model.

(to prevent anemia and other nutritional deficiencies), basic education about iron deficiency anemia and indicators of energy status.

Team members began collecting data related to the delivery of care resources, the processes of the delivery of care, and the outcome of that care. A number of methods were used to collect this information including one-to-one interviews, group discussions and direct observation of workers and patients. Patients attending the clinics were also interviewed to determine their level of satisfaction and awareness of nutritional and health messages.

**The first results**

Several areas were identified by the team members as having aspects for improvement:

- lack of appointment and tracking systems for patient follow-up;
- absence of instructions on nutritional education and counseling;
- insufficient laboratory testing for IDD;
- low client satisfaction.

Since June 1994 teams have used problem-solving tools (e.g. flowcharting, cause/effect analysis, run charts, and others) to identify and agree on important problems. Each problem is then defined operationally and the team collects data in the input-process-output context to study and understand causes for that problem. Of course, teams collected only the data needed to measure changes in the processes and outcomes. For example, within a 3-month period at the Luxor clinic (one of the rural clinics in the district) there was a substantial improvement in mothers’ knowledge of nutritional needs. Health workers developed a poster and a simple dietary information sheet to convey the daily messages to mothers concerning their dietary intake during pregnancy, causes of iron deficiency, and a correct course of prevention and treatment of such deficiency. Subsequently, teams developed other key educational messages such as: drink milk; eat vegetables and fruits; and, when focusing on iron deficiency, eat liver at least once a week, eggs, black honey, and lemon after tea. In addition, team members conducted exit interviews with each mother, asking her to repeat these messages.

Literate families were also encouraged to maintain a food diary that was provided to them by the clinic. For illiterate mothers, special diaries with colorful pictures of food were provided and they were encouraged to mark the ones they should be taking. Hands-on cooking demonstrations were also provided, along with messages about the nutritional values of green leafy vegetables, fruits, and milk.

To introduce dietary education to the patients in the clinics, the lessons were based on the theory of the Health Belief Model (HBM). HBM identifies the concepts and components of theories influencing behaviors, i.e. perceived severity and susceptibility or the belief of the probability an individual may contract or be affected by an illness [9]. It also determines that health measures taken by individuals are cued by the perceived threat of illness and their behaviors are reinforced.
by associated events, punishments, environmental factors, expectations or benefits. Values of outcomes and perceived barriers to the preventive actions are other components of HBM. The theory introduces the key concept that self-efficacy is shaped by demographics, psycho-sociological factors, education and orientation. ‘Benefit’ from taking health measures, i.e. reducing the threat of disease, counterbalances the ‘perceived barriers’ to those activities. The individual weighs, through reasoned analysis, an action’s effectiveness against its negative aspects. These could be cost, transportation problems, lack of information/education or other potential obstacles. Perceived threat and benefit produce the desire to avoid the illness, and particularly cues the individual to initiate preventive action.

The study population

From a total population of 6400 in the catchment areas of the two clinics, 180 pregnant mothers (and their 180 children) were randomly selected/recruited from all those who were diagnosed (from the medical records) as having an IDD: 122 were from Al Fayoum clinic and 58 were from Luxor clinic. An IDD is determined according to a lower than normal iron blood level. The attending physician must concur with the findings to make such a diagnosis.

The impact

At first, only 45 out of 180 (25%) pregnant women with IDD could accurately repeat the key nutritional messages. However, after only 3 months of participation in this project, the QA intervention teams found that 80% of the same women (144 out of 180 women) demonstrated a reasonable knowledge of these messages. Moreover, mothers had an increased understanding of good nutrition and its impact on pregnancy and the well-being of their children.

The teams recommended other changes to the Health Directorate that resulted in the reduction of clinics experiencing stock-outs of iron and the removal of some policy restrictions regarding iron prescriptions. Another result achieved by the quality improvement teams was a 75% improvement in client satisfaction at Etsa Clinic in Al Fayoum Governorate. Clients reported being more satisfied with the reception area, interpersonal relationships with their doctors and nurses, and explanations given during a clinic visit concerning iron deficiency and the importance of adequate nutrition.

One of the teams’ quality achievements was the redesign of the appointment system for outpatient clients with iron deficiency. Teams developed an organized system for follow-up care for each woman and child with iron deficiency. Every day, a social worker who was a member of the team identified those clients who did not arrive for their scheduled appointments and promptly contacted them to explain the importance of visits and to reschedule missed appointments.

There were 122 pregnant women at Al Fayoum clinic who, in June 1994, had IDD; as a result of the QA project this had been reduced to 31 (14%) by November 1994 representing an almost fourfold decline in IDD prevalence in the sample population. The number of children aged 5 years or less with IDD in the same clinic decreased from 45 (37%) in June 1994, to six (5%) in December 1994. Similar results were achieved at the Luxor clinic. Thus, the QA intervention seemed to be effective in reducing the prevalence of iron deficiency in the two districts.

All of these efforts were achieved with very minimal additional cost – iron supplements and extra blood testing to determine iron levels. The teams were comprised of health care workers who were employees in the same districts of the clinics’ with no additional costs to the project; their job descriptions were amended to include QA activities.

Conclusions

The population in Egypt has unique cultural beliefs and psycho-sociological aspects; however, health workers must refrain from viewing this cultural diversity as a problem. Whenever interventions are planned for a community, the community leaders must be involved in such planning from the outset so that ‘ownership’ of the problem as well as the solution can occur. In addition, assessments of the community must be made to ensure that the resources exist within the community to sustain the new program. By keeping the socio-cultural diversities in mind, any obstacles may be overcome, as is evident from the project described in this paper. Also, a theoretical basis is extremely valuable in planning and implementing the appropriate interventions [10]. The PITs kept all of these perspectives in mind when planning improvements in education delivered at health clinics. As a result of this, nutritional knowledge improved (100% of the women in the sample could recall the nutrition messages they were taught about iron-rich food and eating habits at the end of the study period compared to 0% before the intervention began). Five essential messages were developed in easy-to-read pamphlets in the local language and used to increase the awareness and knowledge of these women about their micronutrient needs, e.g. to drink milk, eat vegetables, fruits, honey and take lemon after tea, etc. In addition, the number of cases of IDD among the pregnant women studied was reduced. Client satisfaction, the overall satisfaction rate with the care they received and the satisfaction rate with health care workers improved at both clinics. Of course this project did not include a control group to provide a comparison regarding the impact of the intervention on iron deficiency. However, anecdotal information from the population at those locations suggests that there has always been a high prevalence of iron deficiency. To the best of our knowledge, the study sample was not exposed to any other interventions to reduce iron deficiency during the time of this project, and so the iron deficiency prevalence decreased probably as a result of the interventions prescribed. Similar projects that make use of quality assurance principles for
intervention with such extremely low resource consumption should be encouraged and supported. These projects should prove to be beneficial in solving many other types of problems and challenges.

References