

The Community-Based Child Health Integrated Program in Iran: A Mixed-Methods Process Evaluation

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Abstract: *Objectives:* The community-based Child Health Integrated Program (CHIP) was established to improve children's health status in Iran. The current study was performed to understand how this program was implemented and experienced by the care providers and target group.

Methods: A total number of 249 mothers who had children under 5 years (clients) and 70 caregivers (providers) were selected from 42 health care centers of Tabriz city to participate in the study. Quantitative and qualitative data were collected using two separated semi-structured interviews as well as self-developed questionnaires. The mixed-method process evaluation study was examined and reported the exposure and satisfaction status of the clients, and reach, delivery, fidelity rates, and contextual factors toward the CHIP.

Results: Overall, low reach (11.2%), moderate-exposure (62.6%), and high satisfaction (80.1%) rates of the clients were reported to the program. The fidelity rate of the program tools was 42.9%, considered as an inadequate rate. Anthropometric measurement and vaccination of the children, as well as face-to-face training sessions for the mothers, were well delivered. However, some parts of the program including follow-up and group training sessions were delivered poorly.

Conclusions: This process evaluation study demonstrated that the CHIP is a promising intervention for improving children's health care. However, the barriers identified in this study warrant consideration in subsequent health care needs among children. Further research is required to identify ways to improve the implementation and delivery of this intervention.

Practice Implications: There is a dire need to enter some audit and feedback strategies in the form of monthly tracking of process indicators to extent of implementation of intervention components.

Keywords: Children, process evaluation, community, child health integrated program.

BACKGROUND

Childhood is considered one of the most critical and sensitive parts of life/lifetime. Poor health conditions of children may be associated with higher levels of chronic disorders such as cardiovascular and lung diseases, arthritis, and cancers in adulthood [1]. In 2018, the number of children under 14 years old was reported 1.958 billion, which was 25.79% of the total population in the world [2]. In the same year, 5.3 million of the children's deaths occurred in the first 5 years. In 2020, a number of 35.8 children under age 5 dead per 1,000 live births [3]. Children under age 5 are prone to various disorders and malnutrition compared to other age groups. There are some interventions including immunization, accessibility to proper nutrition, safe water, and food that can prevent most of the early deaths among the children and improve their health status [4]. Many countries' governments try to respond to the health needs of children by adopting these ways,

especially in primary health care (PHC) settings. Primary health care services are arranged across various levels according to the population size of every society, which resulted in lower childhood mortality and morbidity [5].

The PHC in Iran was appeared in 1979, as the first level of contact between families and the health system [6]. The provision of health care services throughout PHC has significantly decreased child mortality rates [8]. Over the last years, the focus of PHC in Iran is to deliver free public facilities with the aim of prenatal care and vaccination [6]. It took only 3 years to increase neonatal vaccine coverage from 33% to more than 90% nationwide [9]. One of the running programs all over the primary health care centers in the country is the Child Health Integrated Program (CHIP), which was established to improve children's health status [10]. To the best of the authors' knowledge, there are not any studies to evaluate the implementation process of this national program. As the process evaluations of complex interventions help to provide specific insights into actual implementation success, causal assumptions, and contextual factors [11], this study

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Table 1: Available Services of Child Integrated Health Program in Iran

Actions	Age	3-5 days	14-15 days	30-45 days	2 months	4 months	6 months	7 months	9 months	12 months	15 months	18 months	2 years	2.5 years	3 years	4 years	5 years
Physician checkup session		●					●			●			●		●		●
Immunization					●	●	●			●		●					
Growth monitoring		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Nutritional assessment		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Oral evaluation							● (the first tooth erupts)										
Child abuse assessment		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Vitamin A + D prescribe		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Iron prescribe							●	●	●	●	●	●	●	●	●	●	●
Follow-up sessions	Breast milk	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Metabolic	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Genetics	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Vision	● First visit		○ (prema ture infant)				●									●
	Hearing	● First visit	○	○	○	○	○	○	○	○	○	○	○	○	● once every 3 to 6 years	○	○
	Development (RED FLAGS)				●				●							●	
	Development (STANDARD TEST)						●			●			●				●
	Blood pressure	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Anemia					○				○	○	○	○	○	○	○	○
	Dyslipidemia												○				○
Tips for parents (educational sessions)	Maternal health	●	○	○	○	○	○										
	Child nutrition	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Child injury prevention	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Dental and Oral health	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Environmental factors affecting health	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Improving child's development	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

● For all children
○ For at-risk children

aimed to evaluate the process of CHIP implementation in Iran.

Overview of the Child Health Integrated Program

The CHIP was first developed in 2004, and since it, 2005 has been implemented in every primary health care center of Iran. The purpose of this program is to diagnose and care for healthy or susceptible children to various disorders with no specific signs and symptoms. According to Table 1, the planned health services are delivered to all of the children after discharge from hospitals. At each visit, the growth status, breastfeeding, and adjunctive nutrition are assessed by a program provider at the primary health care center. Parent-child interaction, general screening including vision, hearing, and oral health of the child, also, are considered. Moreover, free vaccinations and nutritional supplements for children, as well as some care advice and nutritional education sessions for parents, are provided by this program [12].

METHODS

Field of the Study and Participants

The current mixed-method, cross-sectional process evaluation study was conducted from February to June 2019 in Tabriz city, located in northwestern Iran, as the capital of East Azerbaijan Province at the PHC setting. A stratified three-stage random cluster-sampling method was used to select the participants. For the first stage, the city was divided into 10 civic areas including 19 health care complexes, and all of them were selected by the census. In the second stage, 40 of 57 primary healthcare centers were selected as clusters. In the last stage, a random selection of subjects from each cluster was done using simple randomization tables, according to a probability proportion-to-size sampling technique. A total of 249 mothers who had children under the age of 5, as the program clients were invited to participate in the study. The mothers whose children had a chronic disease including cardiovascular disorders or diabetes were excluded. Also, 70 of every primary health care center staff including nurses, nutritionists, and physicians was asked to participate in the study as the program providers. Informed consent was signed by both the clients and providers.

Process Evaluation Assessment Tools

Two separate well-developed questionnaires for clients and providers were used to collect data. Initially, the drafts of the questionnaires were developed in

Persian, as the local language. In the next stage, a panel of experts ($n = 10$) specializing in the fields of nutrition and health education evaluated the validity of the instruments. The reliability of the scales was assessed through the questionnaires being completed by 12 eligible clients and 7 providers at two primary health care centers. After 4 weeks, a retest was conducted using the same participants and finalized to be used in the study.

Two semi-structured interviews were conducted with clients and providers. The face-to-face interviews were conducted for 30-45 minutes until saturation in a segregated space in a primary health care center.

Design of Process Evaluation

The finalized questionnaires consisted of 6 main sections including reach, exposure, delivery, fidelity, satisfaction, and context of the program [13]. Reach of the program was assessed by the number of the children who received the CHIP, while the barriers of their dropping out of the intervention were asked. Exposure of the clients was calculated due to the awareness of the clients from the existence of the total program and every service of CHIP. The satisfaction rate was also defined for the overall program and every provided service. Delivery was calculated in total and for any parts of the program. Fidelity was defined as the program delivered as intended. The main reasons for clients' withdrawal and information on their adaptations were asked from both clients and providers to investigate the contextual factors (Table 2). Four trained nutritionists were recruited for data collection, while they had passed training sessions on the basic techniques of data collection.

Data Analysis

All participants' responses to the open-ended questions and interviews were transcribed. To identify themes related to the response, they were organized by topic and then summarized. The answers were classified independently by two researchers. Arguments among verifiers were resolved by consultation with a third verifier. The quantitative variables of questionnaires were demonstrated with mean \pm standard deviation (SD) or number (percent). Descriptive statistics were obtained from quantitative data using IBM SPSS Statistics (version 20.0).

RESULTS

The current mixed-methods study took place at 42 primary health care centers in Tabriz city, Iran.

Table 2: Process Evaluation Components and Data Sources

Components of process evaluation	Data sources	Asking from	
		Clients	Providers
Reach	Semi-structured and closed questions	✓	✓
Exposure	Closed questions	✓	
Delivery	Interviews and closed questions	✓	✓
Fidelity	Interviews and semi-structured questions	✓	✓
Satisfaction	Semi-structured and closed questions	✓	
Context	Interviews	✓	✓

Characteristics of Clients and Providers

A total number of 249 clients responded to the administered questionnaire with a response rate of 95.77%. The mean age \pm standard deviation (SD) of mothers was 29.91 \pm 6.11 years. Most of them (96.79%) were married and lived with their spouses, while others (3.21%) live lonely; 45.38% of them had college or above educational level and 75.90% were housewives.

There were a total of 70 program providers, among whom, 47 (67.14%) were nurses, 12 (17.14%) were nutritionists, and the others 11 (15.71%) were physicians. The mean age \pm SD of them was 36.66 \pm 6.99 years.

Availability of the Program

The availability of the program was determined by investigating the running programs in all of the 42 primary health care centers by the researchers. All of the providers had received training on children's care content and were using them for children's care in every center. A range of health professionals was trained to deliver the program including nurses, nutritionists, and physicians.

General Determinants of the CHIP Process Evaluation

The overall reach rate of the program was 11.2%, considering the inadequate rate. As shown in Table 3, every mother should refer to the primary health care center to benefit from the CHIP for at least 9 sessions after childbirth. Among the benefited clients from the program, 74 (36.10%), 58 (23.3%), and 73 (29.4%) had received the services for one, two, and 2-8 sessions, respectively, that were not sufficient according to the

program plan. Among the clients who had visited the health care centers at least once, 62.6% were exposed to all provided services by CHIP.

Face-to-Face Educational Sessions

A total of 61.4% of the health providers reported that they have informed the mothers who had children less than 5 years to participate in the face-to-face educational sessions. Besides, 92.4% of the clients who participated in the process evaluation reported that they were informed about these sessions. It is suggested that the exposure rate of the clients to the service of the CHIP was moderate. The reach rate of the service of the CHIP was calculated at 82.3%, which could be considered as a high-level rate. Most of the clients (82.9%) received the educational information personally from nutritionists, due to their relative expertise, while the others benefited from a nurse or physician. Most of the clients (72.3%) believed that the health staff were motivated to their assigned tasks and paid high attention to their demands. 51.8% of the clients were satisfied with the presented educational sessions by nutritionists and they stated that they had received this service at the planned time. A standard face-to-face education meeting should have a time range from 20 to 40 minutes [14]. The time duration of each face-to-face educational session as most of the clients (70.7%) stated in this study was below 30 minutes, which should be considered as an inadequate duration. The overall satisfaction rate of the participating clients who completed the educational program was 75.1%.

According to the providers' opinion, all of them completed at least one training session with the content of children's care, which was conducted by the responsible center and they believed that they can

Table 3: Planned Health Services of Child Integrated Health Program in Iran

Visits Schedule	Proceedings
Neonatal visit	1-Examination of breastfeeding, signs of satiety or hunger, hydration, jaundice, feeding patterns (holding, burping), and feeding tips (breast milk, synthetic milk) 2-Daily administration of a tablet of ferrous sulfate and a multivitamin-mineral tablet containing 150 micrograms of iodine for mothers. 3- The baby's developmental and physical status, Parent-child interaction is monitored. 4- Screenings performed and guidance on child safety, infant behaviors, routine care, safety, and family preparedness are provided.
Third to fifth day and the 15th day of infancy Visits	1-The adequacy of the baby's nutrition, including nutritional status (weight gain), nutrition practices, hydration, jaundice, signs of hunger, and symptoms of satiation are examined. 2- Nutrition guidelines for breast milk or artificial milk are provided to the mother. 3- Daily administration of a tablet of ferrous sulfate and a multivitamin-mineral tablet containing 150 micrograms of iodine for mothers. 4- A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 5-The baby's developmental and physical status, Parent-child interaction is monitored. 6- Screenings performed and tips about mothers' health, infant development, and safety tips are provided.
First-month visit	1-Frequency of feeding, growth mutations between 6 and 8 weeks and increased infant need for breastfeeding, nutrition choices (types of fluids and foods), signs of hunger, infant feeding patterns, starting vitamin D (400 units daily) at 2 weeks are taught to mothers. 2- Daily administration of a tablet of ferrous sulfate and a multivitamin-mineral tablet containing 150 micrograms of iodine for mothers. 3- A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 4-The baby's developmental and physical status, Parent-child interaction is monitored. 5-Screenings performed and tips about mothers' health, infant development, family, and baby matching. and safety tips are provided.
Second-month visit	1-The mother is encouraged to breastfeed exclusively and emphasizes the absence of excess water or fruit juice. In addition to nutritional practices and satiety and hunger, breastfeeding times are reviewed, and child growth mutations times such as the third month are reminded to the mother. 2- Daily administration of a tablet of ferrous sulfate and a multivitamin-mineral tablet containing 150 micrograms of iodine for mothers. 3- A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 4- Immunization of infants, including DTP vaccine (vaccine against diphtheria, tetanus, and polio), Poliovirus Oral Vaccine (OPV), and hepatitis B (Hep. B) drops, is performed. 5-The baby's developmental and physical status, Parent-child interaction is monitored. 6-Screenings performed and tips about mother's health, infant development, infant behavior, family and baby matching, and safety tips are provided.
Fourth-month visit	1-Nutritional status, nutritional choices (supplemental nutrition, food allergies), and baby weight gain are reviewed and nutritional guidance is given. 2-A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 3-The baby's developmental and physical status, Parent-child interaction is monitored. 4-Immunization of infants, including DTP vaccine (vaccine against diphtheria, tetanus, and polio), Poliovirus Oral Vaccine (OPV), and hepatitis B (Hep. B) drops, is performed 5-Screenings performed and tips about oral health, infant development, infant behavior, family function, and safety tips are provided.
Sixth and seventh-month visit	1-The mother is reminded to start supplementary feeding at 6 months and begin feeding table foods at 12 months 2-Providing guidance to the mother on the choice of supplemental nutrition and fluids. 3- Daily 1 mg per kg of body weight up to a maximum of 15 mg of elemental iron supplement equivalent to 15 drops per day is prescribed for the child. 4-A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 5-The baby's developmental and physical status*, Parent-child interaction is monitored. 6-Immunization of infants, including DTP vaccine (vaccine against diphtheria, tetanus, and polio), Poliovirus Oral Vaccine (OPV), and hepatitis B (Hep. B) drops, is performed 7-Screenings performed and tips about oral health, infant development, infant behavior, family function, and safety tips are provided.

(Table 3). Continued.

Visits Schedule	Proceedings
Nine-month visit	1-The mother is provided with instructions on how to feed baby, baby feeding times, starting solids, and drinking from the cup. 2- Daily 1 mg per kg of body weight up to a maximum of 15 mg of elemental iron supplement equivalent to 15 drops per day is prescribed for the child. 3-A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 4- Screenings performed and tips about oral health, infant development, infant behavior, family function, and safety tips are provided. 5- The baby's developmental and physical status*, Parent-child interaction is monitored
Twelfth-month visit	1-Tips for a child's eating independently, eating nutritious foods, choosing the right foods and healthy snacks are offered to the mother. 2-Daily 1 mg per kg of body weight up to a maximum of 15 mg of elemental iron supplement equivalent to 15 drops per day is prescribed for the child. 3-A daily intake of one CC vitamin A + D drops or multivitamin is recommended for infants. 4-Immunization of infants by MMR vaccine (vaccine against measles, mumps, and rubella) 5-The baby's developmental and physical status*, Parent-child interaction is monitored. 6-Screenings performed and tips about family support, establishing routines, dental procedures, changes in child's appetite, and safety tips are provided.
15th, 18 th -month visits 2nd, 3rd, 4 th , and 5 th -year visits	1- The baby's nutrition status is reviewed, and guidance is provided. 2- Daily intake of 1 mg per kg of body weight up to a maximum of 15 mg of elemental iron supplement equivalent to 15 drops per day continued up to 2 years old . 3-A daily intake of one cc vitamin A + D drops or multivitamin continued up to 2 years old . 4-Screenings performed, and tips urinary and stool training, language/hearing improvement, child behavior and development, family support, and safety tips are provided in the eighteenth month . 5-Immunization of infants by MMR vaccine (vaccine against measles, mumps, and rubella) is done again in the eighteenth month . 6-The baby's developmental and physical status*, Parent-child interaction is monitored. 7-Screenings performed, and tips about emotional and communication evolution, sleep routines, outbursts of anger and discipline, healthy teeth and safety tips are provided in the fifteenth month . 8-Other tips like playing with peers, watching TV, training in urine and stools, encouraging physical activity, encouraging reading and writing, evaluating linguistic development, and improving vocabulary pronunciation are performed up to age five .

*If the weight for ages or height for ages curves is above -3 SD but is not be parallel to the growth curve, the patient is referred to a nutritionist.

*If the weight for ages or height for ages curves is below -3 SD the patient is referred to a doctor.

provide simple, useful, and necessary information to the clients.

Group Educational Sessions

The process evaluation of the program revealed that just 13.7% of the clients participated in more than 2 groups of educational sessions (considered adequate sessions to learn necessary contents), which suggested a low reach rate. Almost half of the clients (56.7%) stated that the group educational sessions were held weekly, as the program agenda planned, while 35.6% and 7.7% of the clients demonstrated that these sessions were conducted monthly, or yearly, respectively. This was shown that the delivery of this service was not sufficient. 60.2% and 57.3% of the subjects stated that the group educational sessions had a time duration of 30 to 60 minutes and were conducted with 5-10 participants, respectively. 20.9% of the subjects reported that these group sessions were

held later than the due time, while others (79.1%) stated that the sessions were held timely and in the planned place. The overall satisfaction rate of the clients from group educational sessions was 89.5%. A total of 90% of them stated that all the health staff had enough motivation for the education task and they (81.2%) reported that the sessions were held using group discussions. The training contents of these group educational sessions were considered attractive from 90.1% of the clients' points of view, as well as 41.0% of them believed that the presented contents were beneficial for them. 93.6% of the clients reported that the contents were simple as they benefited to the extent they need. The responders, also, reported some problems with the educational sessions, as 43.3%, 35.8%, and 20.8% of the clients stated that they had struggles with high annoying sounds, high numbers of participants, and ambient weather of the classes, respectively.

Program Follow-Ups

The providers should provide the follow-ups at the planned times (Table 1) for at least 16 sessions for every child under 5 years old. Although 88.8% of the clients had not received all of the planned 16 sessions, most of them (76.3%) believed that the follow-up sessions were held on time, as well as they had high satisfaction with the follow-ups' orders.

71.4% of the providers stated that the mothers were not referred, although they called to them. 74.3% of the providers, also, believed that most of the mothers (especially those who have prosperous economic status) preferred to refer to a specialist instead of the primary health care centers.

Anthropometric Measures

According to Table 3, regular height and body weight measurements of newborns and children should be performed by providers in the centers. 80.3% of the clients reported that this care service was done for their children at least one time from childbirth; however, others (19.7%) had never received this service. This was due to the forgetfulness of nurses because of their high workload. A large percentage of the clients (60.5%) had not enough satisfaction with this care

service, as they reported that the providers had not taken enough attention to their task and their registered measurements were inaccurate.

Posters and Pamphlets

As the program planned, the providers should assemble educational posters with the content of health and nutritional care of the children at the primary health care centers. They, also, have to give contributed pamphlets to the mothers who were referring to these centers. Most of the clients (93.2%) did not notice the presence of these posters at their referred centers. Further, 60.6% of the clients stated that they have received pamphlets in face-to-face or group educational sessions. Furthermore, 66.2% of the clients that received pamphlets mentioned that they had useful content.

As shown in Table 4, 82.5% of the health care centers had not adequate posters and pamphlets to use, as most of the participated providers (94.3%) expressed that these educational tools were not delivered on time and in sufficient quantities by the responsible center. They, also, suggested designing the pamphlets with more conceptual colors and shapes, suitable for all of the mothers with any educational level.

Table 4: Fidelity for Availability of Needed Tools for the Program

Tools		Health care center (n=57)	Comments
Presence of standard anthropometric measures (no. of health care centers)	wall-mounted stadiometer	55	The adult wall-mounted stadiometers were not installed properly in 2 health care centers/ Infant weighing scale had some measurement errors in 3 centers that were not repaired.
	Children weighing scale	57	
	standard flexible centimeter	57	
	Infant weighing scale	54	
	Infant stadiometer	57	
Supplements		36	Some of the supplements (especially multivitamin and A+D drops) were not sufficient in 21 health care centers as they advised the parents to buy them from drugstores
Posters (no. of centers that delivered regularly to clients)		10	47 centers claimed that posters were not provided sufficiently from the responsible center
Education displays (no. of centers that conducted weekly education sessions)		31	Reported problems: Low referrals of mothers Presence of baby with mother Lack of proper physical space Multiplicity of health care providers
Presence of nutritionist at the center		15	Nutritionists were present in a limited number of centers
Presence of vaccine and immunization tools		57	-

Supplementation

According to the CHIP, the specified supplements in Table 1 should be freely given by the providers to the children at specific times. In the first visit, the vitamin A+D drops or multivitamins were provided for all the referred infants, as the clients reported. In the sixth visit, elemental iron supplements were provided for 69.5% of the clients. After the sixth visit, none of the clients had received any supplements from the centers.

68.6% of the providers stated that the supplements were not provided sufficiently by the responsible center and they advised the clients to buy the supplements themselves.

Vaccination

According to the national immunization program of Iran, active universal immunization of BCG (Bacille Calmette-Guerin), OPV (Oral Poliovirus Vaccine), HepB (Hepatitis B), DTwP (Diphtheria-Tetanus-Pertussis (whole cell)), and MMR (Measles-Mumps-Rubella) were provided for all of the children under 5 years old [15]. All of the clients reported that the vaccinations were performed on their children at specified times. The satisfaction rate for this service was 100%.

Clients' Notification to the Program

The main information method of the program should be telephone calls, then 101 clients (67.9%) stated that they were informed of the available CHIP by telephone calls. Others (27.2% and 4.9%) reported that they had noticed the services from TV and social media, respectively.

As a call to the mothers was a main task of the providers, they reported some barriers with this service. 44.3% of the providers were failed to be responded to the clients after childbirth. Most of the providers (97.1%) reported that they had not enough time, as they should call other age groups including adults, elderly, and pregnant women. All of the providers, also, reported that the presence of one phone line in the center disturbed performing regular calls.

Fidelity

The program achieved a low to moderate level of fidelity in terms of the availability of needed tools for children's care. The availability of tools during the implementation of the program ranged from 17.5% to

100%, with a mean availability of 42.9% across all tools, indicating low fidelity overall (Table 4). Although the satisfaction rate with anthropometric measures was low, as mentioned above, the greatest success was in presence of anthropometric measures, which the main center provided for most of the centers before the implementation process. The most important weaknesses of the program fidelity were identified in the presence of posters.

Context

84.3% of the clients stated that the health care centers do not have enough space, the visiting room is not private and the required features to afford sufficient care services for the children were not available. 86.3% of the clients, also, believed that the health care centers had high and adequate availability to them.

DISCUSSION

One of the most important priorities of global health is tackling children's morbidity and mortality. The present process evaluation study evaluated the community-based CHIP in Tabriz city, Iran. Low mean fidelity (42.9%) was, also, reported across all of the program tools. The exposure rate was demonstrated 62.6% and the overall satisfaction rate of the clients to the CHIP was 80.1%. Most of the program services were delivered as planned; however, some parts including follow-up sessions and group educational sessions had some weaknesses. The participants, also, reported a lack of a suitable room for providing health care as a main contextual factor.

In the current study, the overall reach rate of the program was 11.2%, considered as a very low rate and it is not an acceptable situation according to the program plan. In the studies by Howell *et al.*, Jeffrey *et al.*, and Foroumandi *et al.* reach of the health care programs were reported at 31.7%, 40.0%, 20.0% respectively [16-18]. In contrast, some of the other studies reported a high reach rate for the evaluated health care programs [19-23]. Furthermore, some of the present studies have provided home visiting services as a solution to increase the rate of target participation in the children's care programs [16, 24, 25]. It is suggested that there is a need for attempting to reach clients by examining the protocols of CHIP to identify opportunities for improving the reach rate.

Low mean fidelity (42.9%) was reported across all of the CHIP tools. Although, anthropometric measures

and immunization tools had high fidelity, posters, and other educational tools were considered with the lower fidelity. The Fidelity of the materials was, also, inappropriate in other health process evaluation studies [26-28]. The low fidelity rate may be due to the financial deficiencies and underestimating of needed tools especially educational strategies in program plans. Hence, it has been demonstrated that improving these aspects of the program could increase the effectiveness of CHIP.

The extent of the exposure was demonstrated by 62.6% in the study. Other studies reported perceived exposure rates of 57% and 77.5% among the target groups [18, 29]. The most plausible explanation for the lack of a successful program is low exposure to that program [30]. Examining strategies to enhance CHIP exposure is an important recommended strategy to get the desired outcomes.

The satisfaction rate of the clients to various provided health services of the program was varied from 39.5% for anthropometric measurements to 100% for vaccination. The overall satisfaction rate to the CHIP was calculated by 80.1%. In previous studies, the satisfaction rates to provided health care services of the health systems were close to our results, which reported the rate of 75% and 80% in two studies [31, 32]. Anthropometric measures had the lowest satisfaction rate among the provided services of CHIP. The clients reported that the providers had not paid enough attention to their task and they believed that their registered measurements were inaccurate. Since one of the most critical and sensitive seasons of life is childhood, neglecting nutritional status and their growth rate could lead to several problems [33-35]. It is important to providers pay enough attention to this task and the responsible centers tackle the barriers to provide a better anthropometric measurement service.

The delivery of the program was successful in some parts, especially vaccination. However, weaknesses were observed in some services. One of the important services of CHIP is the follow-up that it is also an unforgivable item of US Newborn screening system guidelines II [36]. 88.8% of the clients reported that their children had not received all the planned follow-up sessions, considered that the delivery of this service was very weak. The deliveries of the educational sessions, posters, and pamphlets also were not sufficient. Using the educational tools including posters and pamphlets should be prepared by providers of CHIP. The current process evaluation study reported

that 93.2% of the clients did not notice the presence of posters at the centers. Further, 39.4% of them stated that they have not received any pamphlets from the providers. In recent studies, using posters was less effective than phone calls, text messaging, and a combination of them [37]. Then, It is suggested that text messaging as a reminder and educational tool could be more simple, effective, and cheaper than posters. One of the other important barriers of CHIP delivery was the lack of strong participation of clients that could lead to various problems in diagnosis, follow-up, and appropriate treatment of the children; hence, reminding the clients by text messages and an effective information framework could reduce missed appointments.

In the current study, although, supplementation service was provided to all the referred infants, 69.5% of the clients received iron supplements at their children's sixth-month visit. Further, none of the clients had received any supplements after the mentioned visit. According to the WHO, daily iron supplementation is recommended as a public health intervention for children aged 6–23 months, living in nations with high anemia prevalence [38]. There are also many vitamins A supplementation programs for children under 5 ages in Mali, India, and Brazil [39-41]. Other supplementation interventions including vitamins B, D, and minerals such as zinc and iodine are recommended to the countries with deficiency, which are implemented due to the public policies of each country [42-44]. The current study investigated some contextual factors such as budget limitations of the health system to provide these supplements. Some of the parents also refused to accept the supplementation of their children, due to their low awareness. Holding training classes to raise awareness and change parents' perspectives on taking supplements recommended by health centers is one way to help improve the supplementation service of CHIP. It is also recommended that free supplements be provided only to families who are unable to provide supplements and that other individuals be advised to purchase these supplements themselves and give them to their children.

In the current study, 67.9% of the clients mentioned that they were informed of the available CHIP by telephone calls. However, providers reported some barriers with this service including not having the time or having only one phone line in the center. Telephone support of mothers has shown to be effective in factors including mothers' self-efficacy [45]. Similarly, in

another study in Melbourne, mothers had little success using the telephone number for maternity care. They reported a long time in accessing an interpreter and instead went directly to the local hospital [46].

Along with discussed contextual factors of the CHIP, the performed context analysis demonstrated some other major barriers as contextual factors that may affect the implementation of the intervention or the outcomes. Availability of the clients to the primary health care centers, lack of a suitable place to provide care services, and lack of specialization in all the areas were some of the important points that need specific attention to ensure the success of the program.

Most of the providers stated that the mothers were not referred; also, they believed that most of the mothers preferred to refer to a specialist instead of the primary health care centers. Similarly, in a qualitative study, mothers on infants preferred specialist practitioners rather than GPs in a primary care setting [47]. The reason may be the understanding of mothers about high knowledge and expertise of specialists in the underlying issues of infants.

One of the most strengths of CHIP was its successful vaccination for children under 5 ages. It was suggested that vaccines are an important way of increasing growth and decreasing the rate of morbidity and mortality among children [48-52].

CONCLUSION

The process evaluation study demonstrated that the CHIP is a promising intervention for improving children's health care. However, the barriers identified in this study warrant consideration in subsequent health care needs among children, and further research is required to identify ways to improve the implementation and delivery of this intervention. Last but not least, there is an important need to entrance some audit and feedback strategies in the form of monthly tracking of process indicators related to clients' reach, the fidelity of the program tools, weak points in delivery, and environmental factors to extent of implementation of intervention components.

Practice Implications

Traditional health care approaches often do not reach large segments of the target population, which represents a significant limitation concerning realizing the public health benefits of the health systems in some developing countries.

Key Messages

- Child Health Integrated Program was established to improve children's health status in Iran
- The program has a positive effect on the health status of Iranian children
- The program suffered from some weaknesses and external contexts
- Some strategies of the program need to be revised and corrected

ETHICAL CONSIDERATIONS

This study was performed in accordance with the Declaration of Helsinki. The informed consent obtained from all the study participants. The protocol was approved by the ethical committee of Tabriz University of Medical Sciences, Tabriz, Iran (reference number: IR.TBZMED.REC.1397.1018).

CONSENT FOR PUBLICATION

Not applicable for the current analysis.

AVAILABILITY OF DATA AND MATERIALS

The dataset used and analyzed during the current study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

The authors reported no conflict of interest.

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There is no funding for the study.

AUTHORS' CONTRIBUTIONS

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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