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Primary Health Care Model for Non-Communicable Diseases Management during COVID-19 Pandemic in the Islamic Republic of Iran

Forouzan Akrami[1], Sahand Riazi-Isfahani[2], Alireza Mahdavi Hazaveh[3], Ali Ghanbari Motlagh[4], Mehdi Najmi[3], Mehdi Afkar[5], Alireza Moghisi[3], Mansour Ranjbar[6], Christoph Hamelmann[7], Alireza Raeisi[8], Afshin Ostovar[9,2]*

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Abstract

Background: Given the importance of appropriate response to prevent and manage Non-Communicable Diseases (NCDs), this study aimed to analyze the state of NCDs services at the level of the PHC system during the COVID-19 pandemic and to determine the main strategies.

Methods: In this qualitative study, first, the circulars and guides in Iran's PHC system from the beginning of the pandemic to the end of September 2020 were retrieved manually and by searching the internal websites of the Ministry of Health. All documents about decision-making or governance and coordination mechanisms for the provision of NCDs services were enrolled and analyzed. In the second phase, the status of service delivery for major NCDs was presented in a model, and finally, SWOT analysis was used to analyze the situation and determine the main strategies.

Results: 25 out of 199 circulars and guides were eligible and analyzed. In the crisis phase, most risk assessment, screening, and diagnosis services for NCDs have been suspended, and follow-up and care of patients with major NCDs were done by telephone. In the reopening phase, the general strategies and strategies to increase capacity and provide delayed care were adopted, and the PHC model of the provision of essential services for the major NCDs was developed in low-risk, intermediate and high-risk pandemic conditions. Finally, 16 main strategies were determined with the approach of integrating and focusing on essential services, considering vulnerable groups and the use of E-health technologies.

Conclusion: The results indicate on interruption of NCDs services in the crisis phase while adopting strategies for responding to the pandemic. Revision of the COVID-19 guides with a particular focus on NCDs is recommended.

Keywords: COVID-19, Non-Communicable Diseases, PHC, Essential Services

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Introduction

In recent decades, due to changing risk factors, the rate of accidents and non-communicable diseases (NCDs) has

Corresponding author: Dr Afshin Ostovar, aostovar@tums.ac.ir

1. Medical Ethics and Law Research Center, Shahid Beheshti University of Medical Sciences,Tehran, Iran.
2. National Institute for Health Research (NIHR), Tehran University of Medical Sciences, Tehran, Iran
3. Non-Communicable Diseases Department, Deputy of Public Health, Ministry of Health and Medical Education, Tehran, Iran
4. Non-Communicable Diseases Department, National Cancer Control Secretariat, Ministry of Health and Medical Education, Tehran, Iran
5. Tehran Medical Sciences Islamic Azad University, Tehran, Iran
6. National Professional Officer, NCDs and Mental Health Unit Head, WHO, Iran
7. WHO Representative in I.R.I, WHO, Iran
8. Department of Internal Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
9. Osteoporosis Research Center, Endocrinology and Metabolism Clinical Sciences Institute, Tehran University of Medical Sciences, Tehran, Iran

↑What is "already known" in this topic:
Non-communicable diseases, as the main cause of death in the world, account for 82% of deaths and 75% of the burden of disease in the country. With emerging of the COVID-19 pandemic, NCDs will continue to be a major cause of death, especially in low- and middle-income countries.

→What this article adds:
The PHC model for NCDs management and main strategies were presented to compensate for interrupted NCDs services regarding low-risk, intermediate and high-risk pandemic conditions as well as to continue care and follow-up, during the pandemic.

increased. Every year, 41 million people die from NCDs, which stand for 71% of the world's deaths. 15 million people aged 30-70 years die each year from an NCD; more than 85% of these premature deaths occur in low- and middle-income countries (1).

According to the latest burden of disease report in Iran and neighboring countries (2017), the disability-adjusted life years (DALYs) caused by all diseases decreased in 2015, and the share of NCDs in Iran and its neighbors during 1990- 2015 has widened; the rate for NCDs and injuries in Iran is higher than the global rate and the average rate of countries with medium-high socio-economic index. At present, risk factors for NCDs affect younger people, including children, and account for many health inequalities in populations (2).

COVID-19 disease, caused by the novel coronavirus SARS-CoV-2, was first appeared on December 2019 in Wuhan, Hubei Province, China. The emerging viral disease has caused outbreaks in most of China and more than 200 other countries in a short period of time, including some countries in the Eastern Mediterranean Region (3), and the World Health Organization (WHO) has declared it as an international public health emergency (4).

With the onset of the COVID-19 pandemic, NCDs will continue to be a major cause of death, especially in low-income countries. This is a worrying situation because people with NCDs underlying conditions are at risk for severe COVID-19 disease and death (1). A substantial body of research has confirmed the association of diabetes, cardiovascular disease, cancer, and chronic respiratory diseases as major risk factors in patients with COVID-19 and higher mortality rates in these patients (5, 6). Regardless of COVID-19 deaths, disruptions in the provision of NCDs prevention and control services in pandemic conditions suggest the possibility of a long-term rise in deaths from non-communicable underlying diseases (7).

Evidence shows that the COVID-19 pandemic has significant effects on NCDs. Response to COVID-19 due to limitations such as social distancing, public transportation restrictions, and the focus of health care centers on pandemic control has made interruptions in the access to health services and essential medicines for people with NCDs. As well, the quality and the continuation of these services have been in jeopardy. Also, increasing risk factors such as inability to provide healthy food and proper diet, reduced physical activity, increased smoking and alcohol consumption and overweight can increase the complications of NCDs (8).

With the spread of the disease to Iran, the outbreak quickly altered into widespread community transmission (9). Following the formation of the National Crisis Management Headquarters, several circulars and guides for pandemic management and control were issued. This has led to strategies for controlling the epidemic, such as isolating infected people, suspending some health services, including NCDs prevention and treatment services, closure of schools and gatherings, and social distancing.

Evidence shows that the diagnostic and treatment services of NCDs are increasingly disrupted at the community transmission stage. The results of a rapid assessment of service delivery for NCDs in 155 of the 194 countries showed that the prevention and treatment services had been disrupted since the COVID-19 pandemic began, and despite their global impact, low-income countries have had the greatest influence. Many people with cancer, cardiovascular disease, and diabetes have not received the treatment and medication they need since the onset of the COVID-19 pandemic. Countries should therefore seek innovative ways to ensure that essential services to people living with or affected by NCDs (PLWANCDs) continue to be addressed when dealing with COVID-19 (10).

Due to the importance of providing and continuing essential services and universal health coverage, it is necessary to develop a program to respond to COVID-19 and other future public health threats focusing on the prevention and management of NCDs in the PHC basic health care system.

Developing a cost-effective response program requires answering the questions: What was the state of NCDs prevention and management services in the PHC system in times of crisis? What strategies and practical measures were used in the reopening / reactivation phase? And finally, what are the leading strategies for continuing these services? Therefore, this study aimed to analyze the state of prevention and management of NCDs in the PHC system during the COVID-19 pandemic and to determine the focus points and practical strategies for long-term response.

Methods

In the first phase of this qualitative study to analyze the state of NCDs services, the circulars and guides at the PHC level from the beginning of the pandemic to the end of September 2020 were retrieved manually and by visiting the internal websites of the Deputy of Public Health, Center for NCDs Prevention and Control, Center for Environmental and Occupational Health, Center for Community Nutrition Improvement, all affiliated to Ministry of Health and Medical Education (MoHME) and in coordination with the Director General of Center for NCDs Prevention and Control. All electronic or printed circulars and guides on the topic of decision-making or governance action and coordination mechanisms for the provision of NCDs prevention and control services in the country's PHC system during both the crisis and reopening/ reactivation phases were enrolled in the study. Then, the contextual considerations, general measures, state of NCDs prevention and control services, and the adopted strategies were analyzed based on circulars and guides.

In the second phase of the study, the status of healthcare service delivery for major NCDs at the PHC level was presented in the form of a model in low-risk, intermediate, and high-risk pandemic conditions. Adjusted Incidence Rate (AIR) was used to classify pandemic conditions in a city over a period of time as follows:

$$\mathrm{AIR} = \frac{\mathrm{Np} + \alpha(\mathrm{Nn} - \mathrm{Nu})}{\mathrm{Pop} * \mathrm{t}} * 100{,}000$$

Np: Number of hospitalized cases in which the Covid-19 test result is positive.

NN: Number of hospitalized cases in which the Covid-19 test result is negative.

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Nu: Number of hospitalized cases for which the Covid-19 test result was not recorded.

Pop: City Population

t: Duration in terms of days

α: Impact coefficient of negative or unspecified cases (to consider false negatives)

The following formula is used to calculate the risk score based on AIR. In this regard, the rate of increase in the adjusted incidence rate in the recent week compared to the period of 2 weeks before is calculated to determine the decreasing or increasing trend:

$$\text{Score} = \text{AIRw1} + \delta * \text{Max}(0, \text{AIRw1} - \frac{\text{AIRw2} + \text{AIRw3}}{2}$$

AIRw1: Adjusted incidence rate in recent week

AIRw2: Adjusted incidence rate the week before

AIRw3: Adjusted incidence rate two weeks ago

If the trend is constant or declining, only the Adjusted Recent Week Rate (AIRw1) is used.

If the trend is incremental, the increment is added to AIRw1 with a factor of δ.

- White state (low risk): It is a city whose risk index is a maximum of 1.
- Yellow state (moderate risk): It is a city whose risk index is between 1-2.
- Orange / Red state (high risk): is a city whose risk index is between 2-4.
- Black state (critical): It is a city whose risk index is > 4, and the average number of positive cases of hospitalization in the recent week is at least 5 cases per day.

After presenting the model, the validity of the model was obtained through holding an expert panel with the Directors of major NCDs groups and also the Head of the Center for NCDs prevention and management.

In the third phase of the study, SWOT analysis, which is an effective technique for evaluating weaknesses, strengths, threats, and opportunities in a program or organization (11), was used and after analyzing the current situation, the main strategies based on expert opinions and WHO recommendations were extracted.

In a group discussion session with the attendance of the Directors of major NCDs groups (4 persons) and also the Head of the Center for NCDs prevention and management and his assistants (3 persons), and the faculty members with related experience (4 persons), the weaknesses, strengths, threats and opportunities of the program was determined, and then, the main strategies were extracted and finalized. A peer check was done by 2 members of the National Committee of NCDs prevention and management.

Permission from the Deputy Minister of Public Health was obtained before conducting the study. After explaining the objectives of the study, the verbal consent of the participants to contribute to the expert panel and discussion session was also obtained.

Results

From the beginning of the pandemic until the end of September 2020, 199 circulars and guides were retrieved at the level of the PHC system, among which 25 documents were eligible and fully analyzed. Lists of circulars and guides

Table 1. List of circulars and guides in the early stage of response to the COVID-19 pandemic

Item	Title of circulars / guides	Reference	Date of notification
1.	National mobilization to inform and raise public awareness on COVID-19	Deputy of Public Health	February 23,2020
2.	Instruction of STEPS survey suspension (2020)	Center for NCDs Prevention & Control, Deputy of Public Health	February 23,2020
3.	COVID-19 Epidemic Prevention and Care Guidelines for Cancer Patients, Families, and Healthcare Workers	Center for NCDs Prevention & Control, Deputy of Public Health	February 2020
4.	COVID-19 Prevention and Control Guide for Staff of Occupational and Occupational Health Centers	Center for NCDs Prevention & Control, Deputy of Public Health	February 2020
5.	Circular on temporary suspension of active follow-up of NCDs patients (hypertension, diabetes, asthma, and cancer) to provide periodic in-person care services in health homes, health centers and comprehensive health services centers	Center for NCDs Prevention & Control, Deputy of Public Health	February 25,2020
6.	Guide / Algorithm for Tracking and Telephone Care of People with Diabetes, High Blood Pressure, and Cardiovascular Diseases in COVID-19 Pandemic	Center for NCDs Prevention & Control, Deputy of Public Health	February 25,2020
7.	Instructions on How to Provide Genetics Screening and Prevention Services in COVID-19 Pandemic	Center for NCDs Prevention & Control, Deputy of Public Health	March 3,2020
8.	Circular on the postponement of Newborn Hearing Screening up to one month after birth in hospitals and comprehensive health services centers until COVID-19 control	Center for NCDs Prevention & Control, Deputy of Public Health	March 3,2020
9.	Neonatal screening guidance for sampling centers (hypothyroidism, phenylketonuria, and inherited metabolic diseases)	Center for NCDs Prevention & Control, Deputy of Public Health	March 10,2020
10.	Circular for issuing referral letters for PND2 in order to allow inter-provincial transportation	Center for NCDs Prevention & Control, Deputy of Public Health	April 8, 2020
11.	Circular announcing the closure of Marriage time services centers until the end of the holidays	Center for NCDs Prevention & Control, Deputy of Public Health	April 8, 2020

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related to NCDs prevention and control services in the first and second response stages (distancing and reopening) are given separately in Tables 1 and 2.

In the second phase of the response, instructions on how to re-provide NCDs prevention and management services were developed and communicated based on the social distancing strategy and in accordance with public health protocols (Table 2).

A. Current situation

Context considerations

With the onset of the COVID-19 outbreak, vulnerable groups at the increased risk of severe illness from COVID-19 have been defined in the guidelines, including PLWANCDs. It was decided that pregnant women and employees who are in vulnerable groups continue to work remotely or be recruited in administrative affairs away from direct exposure to COVID-19 patients and/or transferred to locations with a smaller population in full compliance with protective equipment (12).

How to use personal protective equipment, good hygiene practices, physical distancing, and workplace disinfection Guidance for health care workers working in hospitals and health care centers was also developed and vulnerable groups were defined by the Center for Environmental and Occupational Health (13).

Vulnerable groups

Vulnerable groups as individuals who are most at risk for developing severe COVID-19 disease and should be cared for are as follows:

Group A - Patients with underlying diseases, including:

- Cardiovascular diseases
- High blood pressure
- Uncontrolled diabetes (HbA1c> 7.6%)
- Chronic underlying respiratory diseases
- Chronic renal failure
- BMI> 40

Group B- Patients with immunodeficiency including:

- Malignancies
- Chemotherapy
- Organ transplant
- Under treatment with corticosteroids at a dose of 20mg / d or more for more than two weeks or a cumulative dose of more than 600mg / d

General measures

- Remote self-assessment of people suspected of having the disease and at-risk groups, including people with non-communicable underlying diseases and the elderly, by visiting the Salamat.gov.ir website
- Phone follow-up of people who are not registered in the health system in the population covered by the health care provider / Behvarz
- Assigning 16-hour and 24-hour centers and referring

Table 2. List of circulars and guides in the second stage of response to the COVID-19 pandemic

Item	Title of instruction/directive	Reference	Date of notification
1.	A Guide on Social Distancing to Safe Medical Practice in Outpatient Settings During COVID-19 Pandemic	Center for Environmental and Occupational Health, Deputy of Public Health	April, 2020
2.	Circular announcing the start time of marriage service centers	Center for NCDs Prevention & Control, Deputy of Public Health	April 6, 2020
3.	Nutrition guide and lifestyle improvement and strategies for prevention and control of common NCDs during social distancing and the outbreak of COVID-19	Center for NCDs Prevention & Control, Deputy of Public Health	April 6, 2020
4.	A guide to physical activity training at home	Center for NCDs Prevention & Control, Deputy of Public Health	April 17, 2020
5.	Guidelines for implementing an asthma treatment and diagnosis program to reduce the risk of exposure to the COVID-19	Center for NCDs Prevention & Control, Deputy of Public Health	April 19, 2020
6.	Circular on prevention of crowding in comprehensive health services centers providing Marriage time services and reducing intercity trips of couples applying to register for marriage in the event of COVID-19	Center for NCDs Prevention & Control, Deputy of Public Health	April 21, 2020
7.	Comprehensive guidelines for neonatal screening in the COVID-19 pandemic (Hypothyroidism, phenylketonuria and inherited metabolic diseases, hearing loss)	Center for NCDs Prevention & Control, Deputy of Public Health	April 29, 2020
8.	Circular on World Thalassemia Day Considerations on virtual platforms	Center for NCDs Prevention & Control, Deputy of Public Health	April 29, 2020
9.	Circular on resuming neonatal hearing assessment and screening service according to standard condition	Center for NCDs Prevention & Control, Deputy of Public Health	May 2, 2020
10.	Circular on holding the World Hypertension Day ceremony virtually	Center for NCDs Prevention & Control, Deputy of Public Health	May 9, 2020
11.	Circular on the virtual celebration of World Heart Day	Center for NCDs Prevention & Control, Deputy of Public Health	September 20, 2020
12.	Care instructions for patients with hypertension, diabetes, and cardiovascular disease at the onset of Covid-19 disease	Center for NCDs Prevention & Control, Deputy of Public Health	July 2020
13.	Circular for the implementation of the IraPEN plan for the prevention of NCDs in cities with a population of 50,000 people	Center for NCDs Prevention & Control, Deputy of Public Health	August, 2020
14.	Basic service package for the implementation of asthma diagnosis, treatment, and care program during COVID-19	Center for NCDs Prevention & Control, Deputy of Public Health	August 2, 2020

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Table 3. State of the screening services for NCDs in the COVID-19 pandemic

Row	Type	Postponed*
1.	Neonatal hypothyroidism screening	No
2.	Neonatal genetics metabolic diseases screening (and PKU)	No
3.	Neonatal Hearing Screening	Yes*
4.	Pediatric Vision Screening	*Yes
5.	Breast, Cervix, and Colon cancers screening	Yes*
6.	Chronic respiratory diseases (Asthma and COPD)	Yes*
7.	Genetic disorders at the time of marriage	Yes*
8.	Thalassemia	No
9.	Diabetes	Yes*
10.	Risk assessment of cardiovascular diseases	Yes*
11.	Bone Mineral Density	*Yes

suspected cases to the nearest health unit or to boarding centers in the evening and night

- Assigning a hotline for telephone counseling (4030, 190, 1666, and other numbers announced by each university)

- Forming care teams consisting of experts in diseases and environmental health / Basij volunteers for training, disease detection, follow-up, and environmental health interventions such as disinfection of public places and public transportation

- Establishment of an ON-CALL telephone counseling system for elderly care centers

1. Status of NCDs services in the first phase of the outbreak

These services can be divided into two categories of services related to the four main underlying diseases of diabetes, hypertension, cardiovascular, chronic respiratory diseases, and asthma, and screening and diagnosis for all NCDs, including metabolic and genetic diseases and disabilities such as hearing impairment.

- Most risk assessment, screening, and diagnostic services for NCDs have been suspended (Table 3).

- Follow-up and care of patients with diabetes, hypertension, cardiovascular disease, and asthma were done by telephone based on the guidelines.

- Marriage time comprehensive health services centers were closed.

- Genetic counseling was limited to essential items, including suspected high-risk couples, thalassemia carriers, and pregnancy genetic testing, to couples identified under genetic care (PND2) or pregnant women with positive genetic screening results.

- The process of genetic care of the identified couples and genetic care for the prevention of disability of the patients under treatment was performed remotely.

2. Second step of response (reopening and social distancing)

a. Governance and coordination mechanisms

In addition to general strategies for responding to and controlling the pandemic in the reopening phase, in order to respond to and prevent the disruption of NCDs services in the PHC system, necessary strategies were adopted to increase capacity and provide delayed care. Governance and coordination mechanisms were implemented by the Center for NCDs prevention and management, and the PHC action plan to provide essential services for major NCDs prevention and control in the three pandemic conditions was developed.

b. General strategies

• Informing and raising public awareness about how to refer and comply with health protocols and procedures regarding COVID-19 disease

• Continuous provision of personal protective equipment for health care providers

• Providing services based on the health protocols of the Occupational Health Center

• Registration of NCDs state in the health self-assessment system for COVID-19

• Provision of a call center to reduce outpatient referrals - telephone evaluation through the 4030 system

• Develop training guides for transferring content by health team members to the community and target groups

c. Strategies set up to increase capacities and to provide delayed care

• Definition of essential services for prevention and management of NCDs based on the three situations of low, intermediate, and high-risk districts (Table 4).

• Ensuring access and public coverage through telephone follow-up of delayed care in PLWANCDs by the health care provider / Behvarz and setting up an appointment to avoid crowding in health facilities and comprehensive health services centers.

• Telephone calls for clinically suspected cases of neonatal screening, education of parents of sick neonates, follow-up of care, and health data registration.

• Using e-health practices (Tele-Health) for education

• Cross-sectoral coordination to ensure access by vulnerable and at-risk individuals to needed care and implementation of the IraPEN program to prevent NCDs in cities with a population of 50,000 and early diagnosis of diabetes, hypertension, high cholesterol and risk of heart attack and stroke in the next ten years in people over 30 years and also screening and diagnosis of the colon, breast and cervical cancers

• Celebrating national and international events such as World Hypertension and Thalassemia Day mostly as virtual sessions

d. Re-assignment of the health system capacities

- Employing staff with underlying NCDs and pregnant women in low-risk centers as much as possible

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Table 4. The PHC model of healthcare service delivery for major NCDs in the COVID-19 pandemic

State	Cardiovascular diseases (and hypertension)	Diabetes	Asthma	Cancer
Low risk	- Active risk assessment of people with age ≥30 years and case finding - Treatment of new cases - In-person care and follow-up of identified patients	- Active risk assessment of people with age ≥30 years and case finding - Treatment of new cases - In-person Care and follow-up of identified patients	- Opportunistic Case finding - Treatment of new cases - In-person care and follow-up of identified patients	-Active screening and early diagnosis - Treatment of new cases* - In-person care and follow-up of identified patients
Intermediate	- Active risk assessment of people with age ≥30 years and case finding - Treatment of new cases - Tele-care and follow-up of identified patients	- Active risk assessment of people with age ≥30 years and case finding - Treatment of new cases - Tele-care and follow-up of identified patients	- No assessment and case finding - Treatment of new cases - Tele- care and follow-up of identified patients	- Active screening and early diagnosis of colon, breast and cervical cancer - Treatment of new cases* - Tele-care and follow-up of identified patients
High risk	- Passive risk assessment and case finding - Treatment of new cases - Tele-care and follow up of identified patients	- Passive risk assessment and case finding - Treatment of new cases - Tele-care and follow up of identified patients	- No assessment and case finding -Treatment of new cases - Tele- care and follow up of identified patients	-Opportunistic screening and early diagnosis - Treatment of new cases* -Tele-care and follow up of identified patients

- Increasing the capacity of comprehensive health services centers by allocating 16-hour centers for admission of people with COVID-19 disease
- Transfer of neonatal sampling units (for screening of hypothyroidism, phenylketonuria, and other inherited metabolic diseases and hearing impairments) to the nearest non-COVID centers and neonatal sampling by the personnel of the centers of origin preceded by sufficient and effective notice.
- Coordination to increase the capacity of para-clinic laboratory and imaging centers, and to inform clients in this regard.

e. Mechanisms for supplying medicine and equipment

- Preparing and announcing the list of essential drugs to medical universities

f. Surveillance and registry systems

- Pursuing the implementation of the cancer registration system
- Request for registration and evaluation of in-person services within the electronic health record system.
- Identifying the capacities of the country's hearing healthcare system

B. Plan of healthcare service delivery for major NCDs in the COVID-19 pandemic at PHC system level

This plan was designed to prevent and control cardiovascular diseases and hypertension, diabetes, asthma, and cancer at the level of the district based on the pandemic state and population of the city (Table 4). In districts with a population of 50,000 people aged 30 years and older are recalled for risk assessment and screening in low-risk conditions for heart disease, high blood pressure, and diabetes, and new cases are followed up and monitored in person. In case of moderate risk of a pandemic, the recall is made in these cities along with appointments and observance of health protocols, and new cases are treated and followed up and cared for by phone; but in high-risk situations, risk assessment and screening in these cities is done passively. If the disease is controlled according to the guideline / health care algorithm, while prescribing the required medication, the interval between periods of care for patients in moderate and high-risk conditions will be increased to 3 months by the health care provider and to 6 months by the physician.

In districts with higher populations, the procedure of providing the so-called services is in accordance with the aforementioned conditions, but the risk assessment and screening services are provided without recalling in person and are conducted remotely.

Assessment and diagnosis of asthma at pilot universities and affiliated centers in low-risk situations are opportunistic, and new cases are treated and cared for in person. However, in moderate and high-risk situations, the screening is halted and the identified patients are followed up and cared for by phone. People who come in with a complaint of the disease are referred to a physician for further investigation as suspected cases.

Screening for asymptomatic cases and early detection of symptomatic cases of colon, breast, and cervical cancers, in districts with a population of 50,000, in low-risk and moderate-risk conditions was actively performed by recalling, and cases identified in the low-risk situation were followed up and cared for in person. However, in cities with higher populations and also in high-risk conditions, screening and early diagnosis are done opportunistically, and the follow-up and care of identified patients are done remotely.

- Risk assessment: When some tools are used to predict the risk of disease
- Active services: When people are invited to receive service (in cities with a 50,000 population)
- Passive/ Opportunistic services: When people come to receive the service themselves
- Treatment services are not provided to the new cases of

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patients with cancer at the PHC level.

C. SWOT analysis

The current situation is listed in Table 5 based on strengths, weaknesses, threats, and opportunities

D. Main recommended strategies for prevention and control of NCDs in the COVID-19 pandemic

The proposed strategies based on the SWOT analysis, expert opinions and the recommendations of WHO for long-term response are as follows:

1. Development of an integrated plan for the prevention and control of the four main categories of NCDs inspired by the IRAPEN program
2. Redefine the Action Plan for the Provision of Essential Services in NCDs Prevention and Control in the three pandemic conditions
3. Re-definition of essential in-person and remote services and coordination for their registration in the electronic health record system
4. Following-up and providing delayed care by observing the social distancing in the periods of low risk of disease transmission in each district
5. Increasing the capacity to provide services by purchasing essential and para-clinical services from the private sector
6. Organizing the remote referral system in cooperation

Table 5. SWOT analysis

Internal environments (Ministry of Health and affiliated bodies)	
Weaknesses	Strengths
Shift of resources and manpower to COVID-19 pandemic control	National and University-based NCDs prevention and control committees
Interruption or delay in NCDs screening programs	Signing Memorandums with other sectors
Delay in caring for people with NCDs	Academic and university initiatives
Heavy burden of patients seeking care after COVID-19 critical situation	Possibility to increase the capacity of comprehensive health services centers and health facilities
Lack of assessment and follow-up program for COVID-19 patients with NCDs.	Benefiting from the PHC platform for organized patient referral
Lack of self-assessment mechanisms of performance indicators by individuals' university	Benefiting from electronic health record system infrastructure and 4030 Call System
Impossibility of holding face-to-face training courses for headquarters and queuing staff	Registry of remote services in the electronic health record system
Record some unrealistic data in the electronic health record system, such as measuring and recording blood pressure when visiting to receive another service	Purchasing basic and para-clinical services from the private sector
Fatigue or COVID-19 infection of health care providers	Relative monitoring and evaluation of performance indicators using the information of the electronic health record system
Lack of payment protocol to care team members in COVID-19 pandemic	Center for NCDs Prevention & Control in both Public Health and Treatment Deputies of the MoHME
Inconspicuous role of Food and Drug Organization in policy-making to supply essential medicines	MCMC- HIS Data recording systems in the Deputy of Treatment
Poor coordination within the departments	Central Supervisor Office for donors and charity affairs at MoHME
Ignoring adolescents and elderly age groups	Existence of an expert body in the MoHME and headquarters of the medical universities
Dispersion of data collection systems	COVID-19 Crisis Management Headquarters in each university and appointed expert staff
Lack of definition of essential services in the triple pandemic conditions for the four main NCDs	Benefiting from the cohort study platforms
Lack of recognition of in-person and remote services	Possibility of the revision of COVID-19 guidelines with a special focus on NCDs services
Lack of surveillance systems to register, prioritize and refer patients to higher levels based on risk assessment	Notification letter of resuming the IraPEN program for districts with a population of 50,000
Lack of virtual training program for the public on how to receive in-person and remote services	Virtual University of Medical Sciences
Lack of virtual public education programs on healthy lifestyle and risk management	virtual capacities for holding educational webinars
External Environment	
Threats	Opportunities
Impact of long-term stress and the effects of continuous disinfection strategies on the development or exacerbation of NCDs	Support of the National COVID-19 Crisis Management Headquarters
Unfavorable economic situation during the COVID-19 pandemic	The highlighted role of mass media in health information and education
Continuation of pandemic crisis conditions	Further readiness of other departments to cooperate with the health sector
Lack of infrastructure and legal mechanisms necessary for remote treatment and E-prescribing	More participation of donors and charities in the health sector
Higher emphasis of media on COVID-19 than on the risk factors for NCDs	Promoting health behaviors due to the COVID-19 pandemic
Increased complications and mortality of NCDs due to interruption and disruption of care in pandemic conditions	Ability to use the capacity of the Hamrahe-Aval and IranCell mobile operators
Impact of unilateral US Sanctions on funding for NCDs prevention and control programs	Capacity of municipal health houses to manage risk factors
	E-health and telemedicine capacities in the private sector

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with the NCDs control office of the Deputy of Treatment at MoHME

7. Monitoring and evaluation of performance indicators.

8. Providing remote care and counseling for people with NCDs using the platforms of virtual systems and Irancell and Hamrah-e-Aval operators (for follow-up), and E-health capacities of the private sector, and triaging and entering the in-person care cycle just if needed.

9. Providing storage and redistribution of essential medicines in cooperation with the Food and Drug Organization

10. Development of assessment program for people hospitalized due to COVID-19 disease in terms of NCDs

11. Redefine the payment protocol to the frontline COVID-19 health care staff with the support of the National Crisis Management Headquarters

12. Periodic monitoring of the health state of health care providers and consideration of support services

13. Providing educational media for health care workers using the capacity of the Virtual University of Medical Sciences

14. Linking existing data entry systems in order to link NCDs screening services to COVID-19 diagnostic and care services

15. Preparing educational programs for the public focusing on adolescents, the elderly, and PLWANCDs highlighting different aspects of a self-care approach and using the capacity of public media and other existing capacities

16. Attracting the participation of donors and charities to protect vulnerable groups and providing access to the essential medicines they need in the event of a COVID-19 pandemic.

Discussion

The aim of this study was to analyze the state of NCDs prevention and control services in the PHC system amid the COVID-19 pandemic in order to determine the focus points and strategic recommendations for appropriate response. The results of the study indicate the issuance and publication of numerous circulars and guides in pandemic conditions and the postponement of active screening and diagnostics for NCDs in the crisis phase, as well as the adoption of strategies to increase capacity and provide delayed care in the second phase – of reopening and social distancing. In these guidelines, people with underlying NCDs, obese individuals, and the elderly are considered as vulnerable groups, and the strategies adopted to control the crisis sometimes play a supporting role for PLWANCDs, pregnant women and the elderly. The fact sheets published by the Epidemiology Committee of the MoHME also indicate a higher frequency of deaths in those with at least one underlying disease or individuals aged over 60 years (14, 15). Some guidelines have been developed with an educational and self-care approach to prevent the risk factors for NCDs due to lifestyle changes in the pandemic condition. Studies show that self-care education using digital health practices is an important strategy during a pandemic (16, 17).

Analysis of the state of NCDs service provision in the crisis phase, based on relevant directives and instructions, shows that most active screening, risk assessment, and diagnostic services for NCDs are suspended during the pandemic condition and follow-up and screening of patients are performed in a remote mode. Delays in screening programs such as breast and cervical cancer during the pandemic have also been reported by more than 50% of the 155 countries surveyed by the WHO. Medical services are also partially or completely disrupted in most of these countries (18). In most countries surveyed, all or part of the therapeutic services for hypertension (66%), diabetes and related complications (64%), cancer (56%) and cardiovascular emergencies (46%) are disrupted in the phase of community transmission (17). This situation could be due to the closure of emergency outpatient diagnostic and treatment units in accordance with the communicated directives in the early stage of response, the overworking of healthcare providers and the using the full capacity of healthcare centers responding to the COVID-19 pandemic, as well as insufficient telemedicine technology development and its standards. Similar reasons to that of our study have been reported by 77% of countries (10).

In the second phase - reopening, while determining the state of providing essential services for the prevention and control of major NCDs in the PHC system in the form of a model of active and passive services, based on three conditions: low, intermediate, and high-risk pandemics, the adopted NCDs prevention, and management strategies were presented in different age groups, including infants and people over 30 years old. Given that in addition to increasing the risk of disease transmission, we face resource shifts in the intermediate and high-risk pandemic conditions, the approach of providing passive and remote care depending on the type of disease can be an effective strategy. In a systematic review of essential health care models for NCDs, while equating the term screening with case finding in the model proposed by researchers, the passive case finding approach and its preference over the active one in conditions of resource scarcity is recommended (19). WHO Guide (June 1, 2020) on "Maintaining Essential Health Services: An Operational Guide During the COVID-19 Outbreak" for national and provincial decision-makers and managers, while recommending targeted measures to reorganizing and maintaining access to essential quality health services refers to "life periods and disease considerations" including maternal and neonatal health services, child and adolescent health, the elderly, and sexual and reproductive health services (20).

In this study, after analyzing the current situation, strategic recommendations to improve the provision of NCDs prevention and care services in pandemic conditions with an integrated approach and focus on essential services in the PHC system, considering vulnerable groups and using E-health technologies were introduced while taking advantage of internal and external capacities. Policymakers believe that cost-effective resource allocation for NCD control in the context of the COVID-19 response plan requires the adoption of a universal health coverage approach and the integration of these services into the PHC system (21). On the other hand, given the emphasis on the role of enforcement health laws and regulations as a means of achieving universal health coverage, the legal environment

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plays a major role in accessing and benefiting from health services (22). Therefore, reviewing the COVID-19 circulars and guidelines with a special focus on NCDs prevention and control services is one of the main recommended strategies. Globally, two-thirds of countries have reported the inclusion of NCDs services in their COVID-19 national preparedness and response plans (72% of high-income countries vs. 42% of low-income countries). Most services were provided for the control of cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases, and dental services, rehabilitation, and smoking cessation activities were not widely covered by national response plans. The most strategies used to overcome the disruptions were telemedicine and triaging, and 17% of countries have used additional government funding to allocate NCDs control services to the national COVID-19 response plans (10, 17).

Although the analysis of the current state of NCDs services at the PHC system is a strong point of this study, due to the lack of reliable and organized information, to analyze the current state we used national guidelines and directives and to develop a service delivery model and proposed strategies we used SWOT analysis as well as expert opinions and the recommendations of WHO.

Conclusion

The results of the study indicate an interruption or disruption in the provision of NCDs essential services at the level of the PHC system in the crisis phase while adopting strategies for responding to the COVID-19 pandemic. In this study, while outlining the service delivery model, strategic recommendations for improving the provision of prevention and care services for NCDs, providing universal health coverage in pandemic conditions with the approach of integrating and focusing on essential services in PHC, considering vulnerable groups and the use of E-health technologies was presented while taking advantage of internal and external capacities based on the analysis of the current situation. Revision of the COVID-19 directives and guidelines with a particular focus on NCDs prevention and control services and its inclusion in the national COVID-19 preparedness and response plan is recommended.

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Authors' contributions

FA was involved in the conception and design of the study, including the literature review, data collection, analysis, and interpretation, and also drafted the manuscript. AO was involved in the conception and design of the study, including data analysis and interpretation, and also review and evaluation of the manuscript. Other authors were involved in the study design and conduction. All authors reviewed the manuscript critically and approved the final manuscript.

Conflict of Interests

The authors declare that they have no competing interests.

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