factors influencing implementation of Integrated Management of Childhood Illness (IMCI) in Yemen, a highly fragile country

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List of Abbreviations

ANC	Antenatal Care
BEmONC	Basic Emergency Obstetric New-born Care
CHV	Community Health Volunteer
CHWs	Community Health Workers
DHO	District Health Office
DHS	District Health System
eDEWS	Electronic Disease Early Warning System
ENAP	Every Newborn Action Plan
EPHS	Essential Package Health Services
FP	Family Planning
HBB	Helping Babies Breathe
HeRAMS	Health Resource Availability Mappin System
HIS	Health Information System
HWs	Health workers
iCCM	Integrated Community Case Managment
INGOs	International Non-Governmental Organizations
IMCI	Integrated Management of Childhood Illnesses
IMPAC	Integrated Management of Pregnancy and Childbirth
IMSS	Integrated Malaria Surveillance System
GAPPD	Global Action Plan for Pneumonia and Diarrhoea
GDP	Gross Domestic
GF	Global Fund to Fight AIDS, Tuberculosis and Malaria
GHO	Governorate Health Office
KIIs	Key Informant Interviews
MoPHP	Ministry of Public Health and Population
MoPIC	Ministry of Planning and International Cooperation
MSP	Minimum Service Package
NDHS	National Demographic health survey
NGOs	Non-Governmental Organizations
NHS	National Health System
NMCP	National Malaria Control Program
OOP	Out Of Pocket
PHC	Primary Health Care
PNC	Postnatal Care
SCMCHA	Coordination of Humanitarian Affairs, International Cooperation
SDG	Sustainable Development Goals
TEHIP	Tanzania Essential Health Intervention Programme
U5MR	Under-Five Mortality Rate
THE	Total Health Expenditure
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
UNOCHA	United Nations Office for the Coordination of Humanitarian Affairs
WHO	World Health Organization

Glossary

Integrated Management of Childhood Illnesses (IMCI): is an integrated approach, to address the most common childhood diseases, that cause death in developing countries among children aged less than five years. These diseases are measles, pneumonia, diarrhea, malaria, and malnutrition[(1)].

Community IMCI (C-IMCI): is the initial community-based component of IMCI that aims to improve family and community practices toward child health[(2)].

Integrated community case management of childhood illness (ICCM): is a strategy to provide integrated case management services for childhood illnesses among under-five children at a community level by health workers (HWs) where access to health facilities is limited. Case management services consist of assessment, treatment, and referral of severely ill children [(3)].

Scaling up: a term used to describe a process of expanding the coverage of health interventions, it involves increasing the human and financial resources needed to increase coverage[(4)]

Fragile state: "the government cannot or will not deliver core functions to the majority of its people, including the poor"[(5)]

Under-five mortality rate (U5MR): "probability of dying between birth and exactly five years of age, expressed per 1,000 live-births"[(6)]

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Abstract

Background: Yemen is torn apart by multiple internal conflicts and the current war. Economic decline, deterioration of essential public services, food insecurity, poverty, several waves of cholera outbreaks are all challenges resulting in nearly 80% of the population needing some humanitarian assistance.

Objective: To analyse factors influencing implementation of IMCI and its community counter, iCCM, during the crisis and to provide recommendations for decision-makers and implementers to improve the implementation.

Methods: This study is based on a review of the literature and reports. Interviews with key informants have been conducted to triangulate, validate, and obtain more insight.

Findings: IMCI services are incorporated with MSP to ensure the availability of basic health services during the crisis. IMCI policy in MoPHP combined with international community support facilitated the scaling up of implementation. Yet, identified barriers included poor governance, inadequate decentralization and district management, multiple stakeholders with poor coordination, and lack of integration with other vertical programs. Reliance on external funds, shortages of health workers, suspension of training, irregular supervision, poor supply chain to health facilities, and CHWs, and an inadequate health information system are all bottlenecks in the implementation of IMCI and iCCM.

Conclusion: Challenges to implementing IMCI and iCCM services are enormous. IMCI's success is bound to strengthen the functions of the health system, especially in a crisis context.

Recommendation: urgent, concerted action is required to strengthen the health system and develop a collaborative platform to improve strategic planning and decision making for desired child health outcomes.

Keywords: IMCI, iCCM, governance, Yemen, conflict

Word count: 13,182 words

Introduction

I have worked as a Monitoring and Evaluation Officer in a non-government organisation. My work includes monitoring data and ensuring implementation of intervention as planned. During my work, most interventions focused on child health and reproductive health. For child health, the IMCI was the main intervention concentrate mainly on malnutrition. I noticed that the IMCI intervention is poorly implemented and faces several challenges. During my field visits, Most of the beneficiaries were unsatisfied with services provided in health facilities. I noticed shortages in medications and health workers with minimal input from the government which usually focuses on giving permission for implementation.

Before this master, I read on the UNICEF website that "A child under the age of five dies every 10 minutes in Yemen of preventable causes". I felt so bad and I wanted to know why the impact of the IMCI intervention is not touchable.

Appreciation for IMCI is obvious worldwide for its integrity and simplicity. The program is associated with a reduction in mortality and morbidity in many countries when implemented adequately. Many countries have achieved progress towards sustainable development goals, regarding child health, because of IMCI.

Only one study in Yemen focused on IMCI before the war. Hence this study will highlight the current situation of the IMCI program and its community-counterpart, iCCM, aiming to provide some recommendations to improve the implementation.

Chapter One: Background

1.1 Geography

Covering a surface area of 527,970.0 km², Yemen is located in the south of the Arabian Peninsula. It is bordered by the Kingdom of Saudi Arabia to the north, the Arab Sea, the Gulf of Aden on the south, the Red Sea west, and the Sultanate of Oman to the east[7,8]. Yemen is characterized by a variety of topography that includes mountainous plains surrounded by narrow coastal plains and semi-deserts[8].

Yemen divided administratively within the framework of the local authority system into 22 governorates, which are alienated into 333 districts, and 1,996 sub-districts[8].

figure 1: Map of Yemen

Source: European Civil Protection and Humanitarian Aid Operations(9)

1.2. Population:

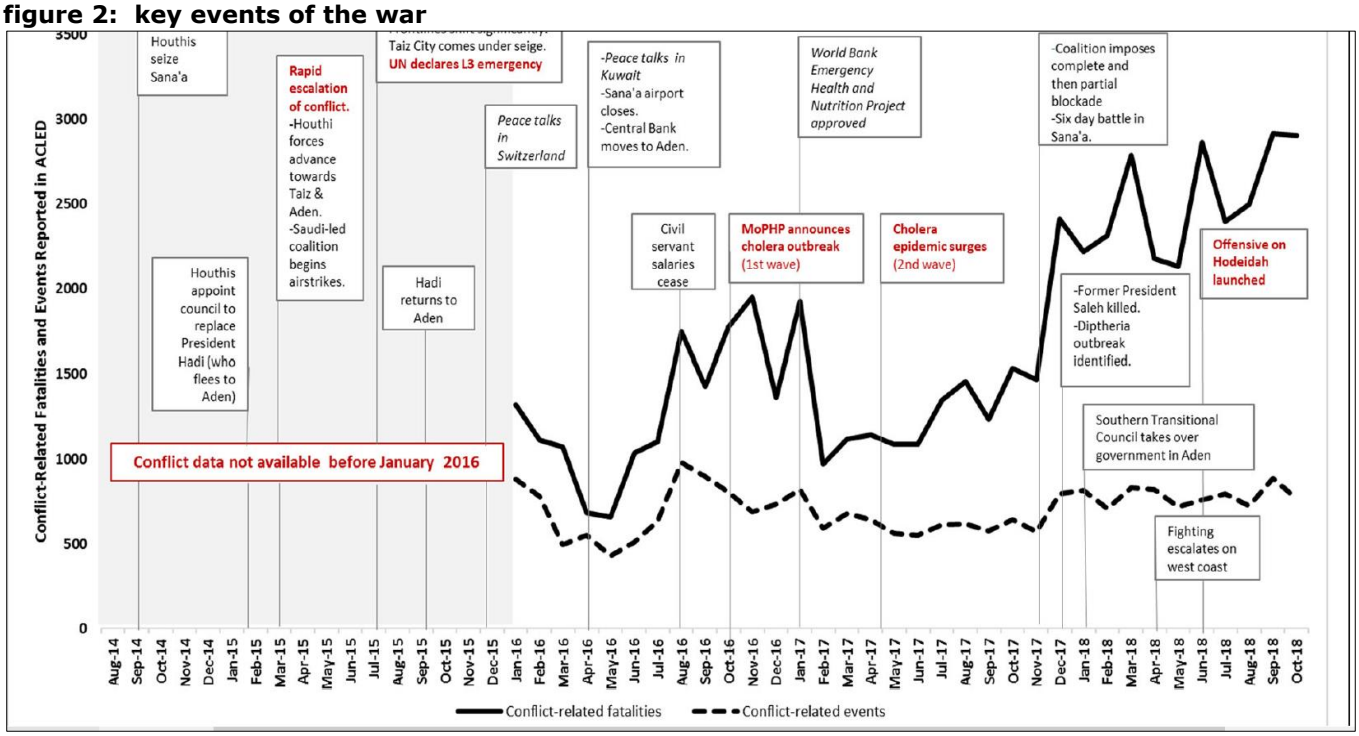
In 2019, Yemen's total population was estimated 29, 162 million with a population growth rate of 2.7%, which is one of the highest rates worldwide[10][11]. This high population growth is adding more pressure on the country to provide public services, including health services[12]. The total fertility rate is also high, about 4.45 children per woman[12]. An unbalanced geographical distribution is another criterion of Yemen's population with 43% of people living in four governorates and around 62% of the population living in rural areas, while only 38% are living in urban[11][13]. Almost 42% of the population is less than 15 years old, children under-five account for 19% of the population. The life expectancy at birth is 66.6 for females and 63.3 years for males[14][15]

1.3. Political Situation:

Yemen is torn apart by multiple internal conflicts that intensified around 2010. A critical situation of political instability is created since the Arab Spring revolution in 2011. In 2014, the Houthi movement took control of much of the country. On March 26, 2015, the Saudi-led coalition launched a military attack to restore the president's role[16][17]. **Figure 2** shows the most important events of the war [18]. Since then, the war has killed thousands

of people, damaged the infrastructure of the country resulting in the worst humanitarian crisis[19].
According to the humanitarian need overview, 200 out of 333 districts are classified as "hard to reach". The humanitarian assistance to the country is experiencing constraints as a result of "conflict, regulatory restrictions, aid interference or increased violence against humanitarian partners"[20].
Out of 178 countries, Yemen ranked number 1 in the Fragile State Index in 2019 with a score of 113.5 (the maximum is 120)[21].

figure 2: key events of the war



Source: Teppis: Reproductive, maternal, newborn and child health service delivery during the conflict in Yemen: a case study [18]

1.4. Socioeconomic characteristics:

Yemen is the poorest country in the region, ranking 177 out of 189 countries in the Human Developmental Index (HDI) in 2018[22]. The country is going through an overall financial and banking sector crisis because of economic deterioration[23]. The reduction in economic activities is associated with a remarkable increase in the country's debt and a decline in public revenues collection. Fiscal data shows a reduction in public revenue from 24% of GDP in 2014 to 8% in 2018. The decline in GDP was a consequence of the war as the ongoing war has negatively affected the public and private enterprises with several economic and disrupted investments. To compensate for this deficiency, the government continued to accumulate public sector salaries and other commitments [24].

According to the World Bank, poverty has been exacerbated, with 50% of the population living on less than $1.90 a day, and 78% live on $3.2[25]. 45% of people reported they lost their source of income. Public personnel has no or irregular salaries since 2016 [26][27].

The war also resulted in deepening the needs, with nearly 80% of the population needing some sort of humanitarian assistance while 14.3 million are in acute need[19].

1.5. Health Situation:

Before the war, Yemen has experienced a considerable improvement in several indicators such as infectious diseases and maternal and child health. There was an improvement in life expectancy and a decline in U5MR [28].
Birth complications, diarrhoeal disease, lower respiratory tract infections, and other infectious diseases were the main causes of death in the country before the war. Cardiovascular diseases were new health problems, and the prevalence rates of other non-communicable diseases were lower than the Eastern Mediterranean[29][28].
An adverse impact of war on the health status of the population was obvious as life expectancy decreased, and maternal mortality ratio and under-five mortality rate(U5MR) increased. An estimated 25% of the population, including 1.2 million pregnant women and 2.1 million children, have severe or moderate malnutrition[20]. Several numbers of cholera outbreaks were reported in the country during the war because of lack of access to water and sanitation [30,31,32]

1.5.1. Health System:

The health system comprises three levels. The first level consists of primary health care (PHC) units and centers. Services provided at this level are mainly preventive services, IMCI, family planning, immunization, and few curative services besides community base services[33]. Health units provide services to 5000 of the population while the health center can serve up to 10,000 of the population[33]. There are 3047 health units in the country, and it should be staffed with one medical assistant, one midwife, and two health educators[34][33].
The second level consists of district and Governorate hospitals that provide the same services in level one besides curative services. There are 53 governorate hospitals and 182 district hospitals in the country. The third level is a referral hospital where curative services are provided for complicated cases[34][33].

In the past, the health system governance and delivery of health care services were among the responsibilities of the Ministry of Public Health and Population (MoPHP) and authorised by Public Health Law No. 4 of 2009[35].
In 2000, the Yemeni parliament approved a local Administration law allowing 22 governorates to handle and manage several services locally, and the MoPHP adopted the District Health System(DHS) approach in 2002[33]. Through the law, decision-making was assigned to local councils at governorate and district levels instead of the central level, giving them the authority over finance and service organisation to develop strategies, supervise, and monitors implementation of the activities. Health care was governed at three levels: District Health Offices (DHO) at the district level, Governorate Health Office(GHO) at the governorate level, and centrally by the MoPHP[11][28][36]. More detail about decentralisation in **Annex 1**.

1.6. IMCI Overview

Over the last three decades, U5MR has reduced by more than half, from 91 in 1990 to 43 deaths per 1000 live births in 2015[37]. Yet, an estimated 5.3 million children under-five died all over the world in 2018[38]. Most of these deaths occur in LMIC where malnutrition and infectious diseases, coupled with poverty and inadequate health services, are the main causes of child mortality and morbidity[39].

In 1995, IMCI was introduced as an integrated intervention for managing survival and the health status of children in countries with U5MR 40 deaths per 1000 live birth or more[40]. Evidence-based, the guidelines and training tools were developed focusing on major diseases that cause child mortality and morbidity, including diarrhoea, measles, malaria, pneumonia, and malnutrition[41].

Usually, children suffer from more than one disease, so IMCI was introduced to manage these conditions holistically through early detection, prevention, treatment, and health promotion in the community. IMCI has three components: strengthening health systems, improving health worker skills, and improving family and community practices(42). In 1998 Community IMCI or C-IMCI was developed as WHO and UNICEF established a guide, aiming to improve the community and household practices[(2)].

In 2003, care of newborn, aged 0-7 days, was added to IMCI to be known in many countries as IMNCI. Further guidance was added to the strategy in 2011, including caring for newborn and children in the community, known as integrated community case management (iCCM). In this guidance, community health workers (CHWs) conduct home visits to provide services for children under-fives and new-borns. Among these services are diagnosis and treatment of malaria, pneumonia, diarrhoea, and detection of malnutrition. This community-based adaption is essential where access to health facilities is poor [(3)(43)].

1.7. IMCI in Yemen:

IMCI was included in the Health Sector Reform Program's "Basic Benefit Package" at the end of 1990s, and in 2000 the MoPHP approved this strategy officially to replace separate disease-specific program, reduce mortality and improve management of childhood diseases. In 2002, implementation of IMCI started in all primary health care centres and units of two districts. In 2004, IMCI expanded more by adopting mobile teams to increase access to child health services. At that time, not only the service package was expanded, IMCI was also included in the teaching program of some institutes. In 2008, the strategy adopted community health volunteers (CHVs) to increase access to health services in remote areas (44)(45). **Table 1** shows the phases of IMCI development in Yemen.

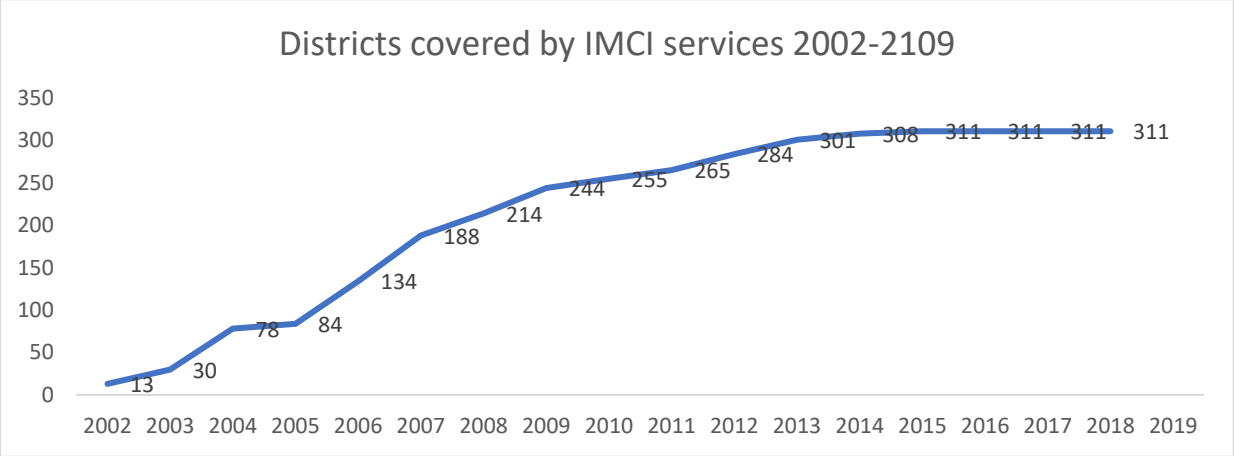
table 1: The most important phases of the development of IMCI and iCCM in Yemen

Year	achievement
1998	Stage of introducing IMCI in Yemen
2000	Defining the materials and approach according to health environment training material for the IMCI.
2002-2003	Pilot training stage
2004	Expansion of the training process in the governorates and districts
2007	Introducing of integrated outreach activities
2008	Training for community services
2010	The beginning of caring for a sick child in the community through Community Health Volunteers (C-IMCI)
For iCCM implemented by National Malaria Control Program (NMCP)	
2011	The first version of CHVs guidelines developed.
2015	The national strategy of iCCM through Community Health Volunteers and the Training Guidelines issued
2016	the ToT's workshop conducted for 39 iCCM trainers
2018	500 CHVs were trained and started delivering the ICCM services

Source: Author's summary based on KIIs and report from Ministry of MoPHP, IMCI Department(44)

Integrated outreach activities started in 64 districts in 2008 then expanded gradually reaching 277 districts by 2015. Similarly, the number of districts covered by IMCI services was increased gradually to reach 311 districts out of 333 districts (93%) by the end of 2018(45).

Figure 3: Districts Covered by IMCI services 2002-2019



Source: Author's summary of a report from MoPHP, IMCI department(44)

Chapter two

2.1. Problem Statement

The right of every child to survive was among the most crucial rights, promised three decades ago, in the Convention on the Rights of the Child[38]. The under-five mortality rate (U5MR), is a core indicator for the health and nutrition status of a child, reflecting the coverage of basic health services as well as social and economic development(46). Global efforts called to decrease under-five mortality by two-thirds between 1990 and 2015, in the Millennium Development Goals (MDG4). Worldwide, under-five mortality has decreased from 88 deaths per 1,000 live births in 1994 to 43 deaths per 1,000 live births in 2015. Only 43% of the countries achieved the Millennium Development Goals (MDG4) in 2015. At the end of the MDG era, 25 deaths per 1,000 live births by 2030 was a new target of U5MR, included in the Sustainable Development Goal(SDG)[37].

In Yemen, a significant reduction in U5MR was achieved as it reduced from 150 in 1985 to 53 per 1,000 live births in 2011[12]. Despite this progress, the ongoing war has created a fragile ground for diseases, leading to an increase in child mortality. A recent report estimated that 140,000 children under-five died in 2019, and if the war continues, the number will increase to 331,000 deaths in 2022. Malnutrition has significantly raised, causing 45% of deaths of under-fives children(47), including almost 84,000 children who died as a result of severe acute malnutrition (SAM) between 2015-2018(48). Poor water, sanitation, and hygiene (WASH) resulted in a cholera outbreak, considered as the largest in the epidemiological history, and children under-five constitute 28.8% of cases[30](49). The conflict also led to outbreaks of diphtheria and measles, because of low immunization coverage, among children which reflected how basic public health activities have been devastated. At the national level, evidence indicates a significant reduction in vaccine coverage between 2013 and 2016(50).

IMCI is introduced to improve child survival in a country with high U5MR, more than 40 per 1,000 live births, through providing prevention and treatment services for major diseases, commonly causing child death[40]. As concluded in a systematic review evaluating the effect of IMCI strategy, the use of IMCI may reduce U5MR, but it needs more research to find the best way for IMCI Implementation (51). Yemen is implementing IMCI, to address childhood diseases, but there are extremely limited studies on factors influencing the implementation of the IMCI, particularly in this current war situation.

2.2. Justification of the study

The role of IMCI in reducing child mortality has been highlighted in many studies(52)(51). There is a controversy worldwide on the role of IMCI within the primary health services package and on the best way to integrate IMCI within health system strategies(53).

Several studies in different countries revealed that implementing the IMCI strategy faces multiple obstacles, including drug shortage, lack of training and supervision, shortage in HWs, inadequate governmental support, and perception of health staff (54)(55). Evidence also showed that countries with weak health systems had faced challenges in implementing IMCI effectively(56). Given the fact that the war has collapsed the already fragile health system in Yemen, in addition to the limited research on factors affecting

IMCI implementation, it is critical to identify and analyse challenges and enabling factors of IMCI implementation.

Only one study, conducted before the war, identified health system factors, influencing implementation of IMCI services which include an inappropriate working environment in health facilities, demolished buildings, lack of water and electricity, workload, and inadequate outreach activities(57). The scarcity of information about factors affecting IMCI might limit the improvement of interventions in line with the Sustainable Development Goals (SDG) targets, and the child mortality rate might continue to increase in the coming years as estimated. Hence this study is intended to explore factors influencing IMCI service implementation. The information from this study would be useful for policymakers and program implementers to identify barriers and to enable factors in designing better IMCI interventions.

2.3. Objectives of the study

General Objective:

To analyse factors influencing implementation of IMCI/iCCM in Yemen during the crisis

Specific Objectives

1. To describe the current situation and the integration of IMCI and iCCM within the basic essential health package
2. To Identify challenges and enablers of IMCI implementation during the crisis.
3. To review IMCI implementation in other countries and compare it with that in Yemen to see what can be adapted in Yemen's situation
4. To identify strategies and tools, to improve IMCI implementation and provide recommendations.

2.4. Methodology

- **Study Design:**

  This thesis is a descriptive qualitative secondary data study. A review of reports and articles has been performed. Additionally, interviews with key informants have been conducted to triangulate, validate, and obtain more insight about issues and challenges of IMCI/iCCM implementation

- **Data collection methods:**

  Literature Review: The study is based on peer-reviewed studies, grey literature, published articles, unpublished study, and international and national reports, national policy, and survey regarding IMCI and iCCM implementation.

  The search Strategy:

  An extensive search has been done using Medline, ResearchGate, Lancet, google scholar, Vrije University library database. Besides, published literature, grey literature, and reports were searched in World Health Organization (WHO), United Nations Children's FUND (UNICEF), Save the Children International Rescue Committee (IRC), United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA). The snowballing technique was used to find more valuable literature. The keywords used

for this research were IMCI, iCCM, governance financing, and health system. **Table 2** shows the keywords used. Studies done in other countries were also reviewed and used in this thesis. English was the main language. The thesis also includes reports from MoPHP that are in Arabic. The thesis mainly includes documents after 2010; however, if relevant, research before 2010 used.

Semi-structured interviews with key informants: Semi-structured interviews have been conducted with eight key informants from MoPHP, WHO, UNICEF, and implementers, such as NGOs, to validate, triangulate and bring insight about challenges and enablers of IMCI implementation. The key informants were selected purposively based on working with the IMCI and iCCM program. An interview guide and consent form are attached in the **Annexes 2,3**.

Table 2: Search Keywords

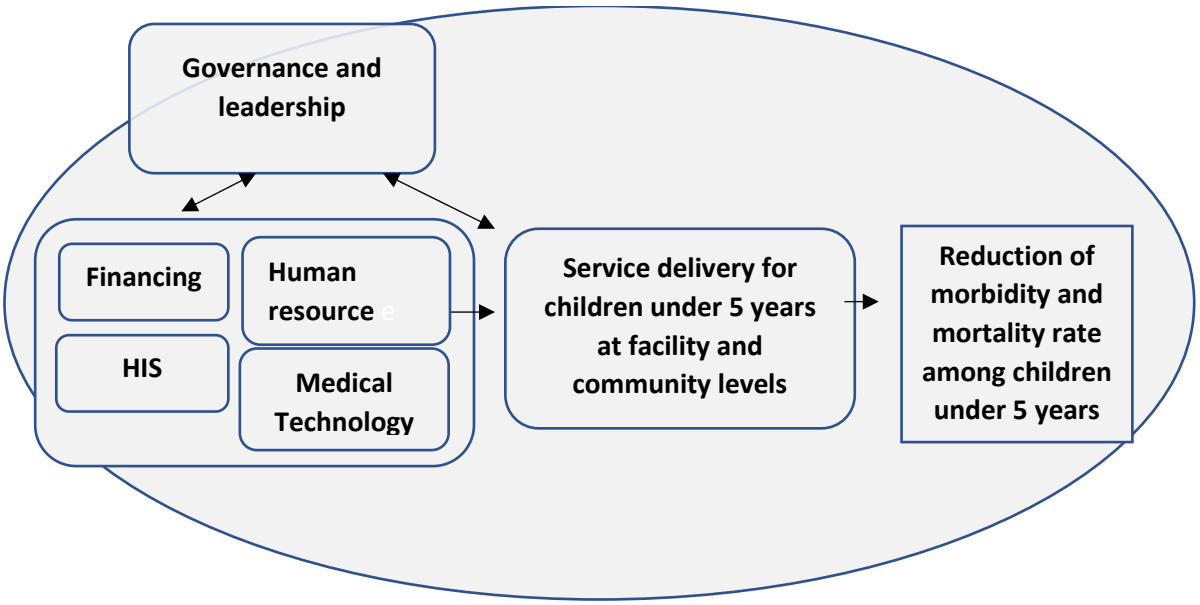
	keywords for the search were " IMCI" "iCCM" in different combination with the following terms:	
		AND
Objective 1,2 and 3	Governance, Finance, coordination, partnership, planning, health system, workforce, human resource, infrastructure, medical supply, Health Information System, child health services, Minimum Service Package, Basic Service Package, HeRAMS, humanitarian crisis, emergencies, U5MR, Malaria, malnutrition, diarrhoea, community	Yemen
		Any country, South Sudan, Afghanistan
Objective 4	Health system strengthing, interventions, programs, accessibility, conflict, war, emergency.	

- **Data Analysis:**

The study adopted a health system dynamic framework developed by Van Olmen and derived from the WHO model, highlighting the dynamic relationships between the health system functions(58). A simplified version, **figure 1,** of this framework, was used to formulate and explain how a health system operates in the context of IMCI and factors associated with each function affecting its implementation. According to the framework, the implementation of the IMCI package, at a facility and community level, is represented as service delivery. The functions (Governance leadership, finance, human resource, health information system, and infrastructure and medical technologies) act as inputs, that influence the process of IMCI implementation. This framework has been adapted because it focusses on actions that are needed by policymakers and implementers to improve IMCI service provision. These five functions are relevant in a country like Yemen, affected by conflict, where these play a major role in the implementation of IMCI. A population factor that exists in the framework was excluded from this study as it needs dedicated research to study it in the future. The author considered other frameworks such as the HRH framework but was excluded as it concentrates mainly on human resources.

For interviews, data was analysed alongside data collection. Notes and tape records were transformed into a well-organised and expanded transcript and then translated into English. Data were synthesized using a deductive framework to categorise data into themes that were coded according to the topic guide.

figure 3: Health system dynamic for IMCI and iCCM



Study limitation:

This study has several limitations:

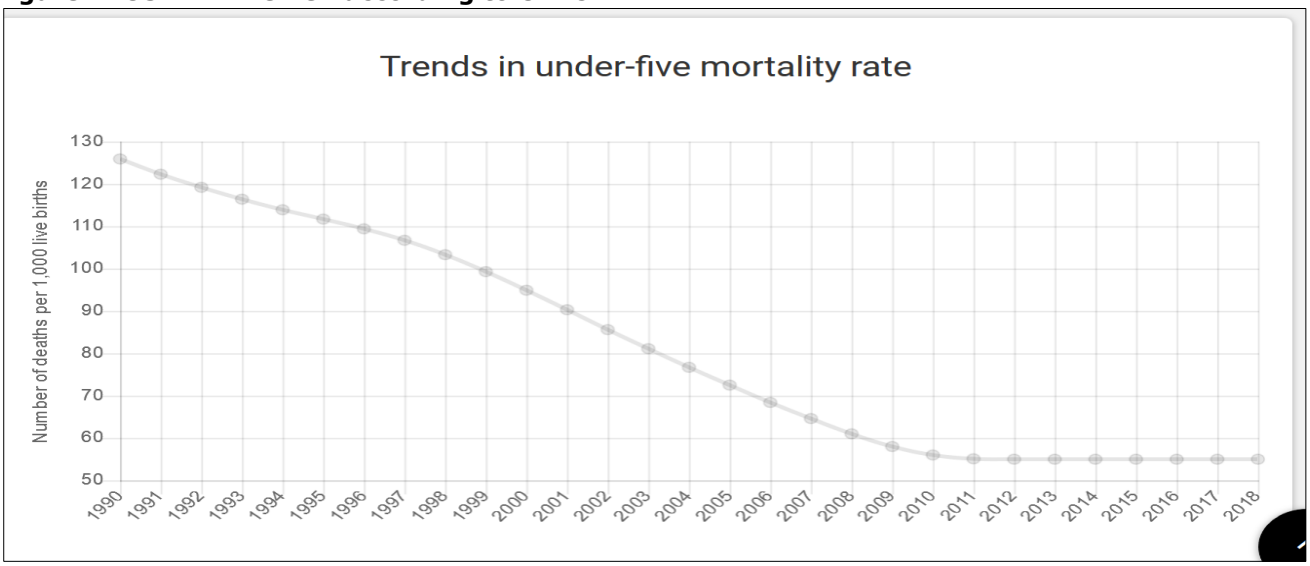
- It is based on secondary data, and there are few studies in Yemen about IMCI and iCCM. But conducting interviews with key informants helped to get insight and more information.
- The national health information system is not functional, and the last DHS was in 2013.
- The number of interviews was limited, combined with a narrow scope of respondents, as no interviews with IMCI/iCCM service providers were carried out, due to time limitation, far distance, and difficulties in coordination.
- The scope of this study was limited to the public sector, despite its critical role of the private sector during the crisis.

Chapter Three: Findings

Under-five mortality and morbidity in Yemen:

The last NDHS, conducted in 2013, showed that there had been a remarkable decline in childhood mortality rates over the past three decades. The U5MR decreased from 150 deaths per 1,000 live births in 1985 to 53 deaths per 1,000 live births in 2011[12]. If the trend of decline were sustained, a further decrease in U5MR would take place in the coming years, which might achieve the Millennium development goal (MDG) in the country.
In 2012, one study estimated the U5MR to be 78.1 deaths per 1000 live births, near to 77 deaths per 1000 live births, estimated by the UN Inter-agency Group for Child Mortality Estimation(59)(60). An increase of the U5MR from 48.9 deaths per 1000 live births in 2013 to 53.4 deaths per 1000 live births in 2015, is estimated by the Global Burden of Disease (GBD)(61).
According to the UN Inter-agency Group for Child Mortality, the U5MR is estimated to be 55 deaths per 1,000 live births in 2018[38]. That number is unchanged since 2011, **Figure 4.**

figure 4: U5MR in Yemen according to UNICEF



Source: https://data.unicef.org/country/yem/

The World Bank database illustrated two trends to be contradictory that among under-fives children, two indicators have increased significantly, from 2011 to 2013, while U5MR remained constant in these years till 2018 with a value of 55 deaths per 1000 live birth(62), **Table 3.**

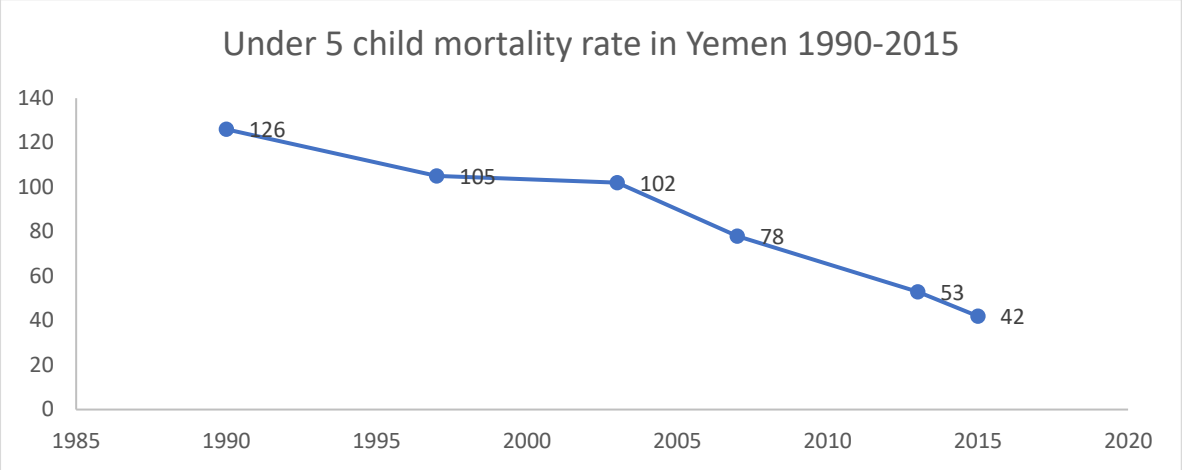
Table 2: Wasting and U5MR in Yemen

Name of indicators	2005	2011	2013	2018
Prevalence of severe wasting, weight for height	4.4	3.4	5.4	
Prevalence of wasting, weight for height	13.7	13.3	16	
U5MR (per 1,000 live births	72.1	55.1	55	55

Source: Author's summary from World Bank Development Indicators

According to MoPHP, there is a decrease in the U5MR rate from 1990 to 2015, but with different figures from other sources. The MoPHP has no data about the U5MR rate after 2015, **Figure 5.**

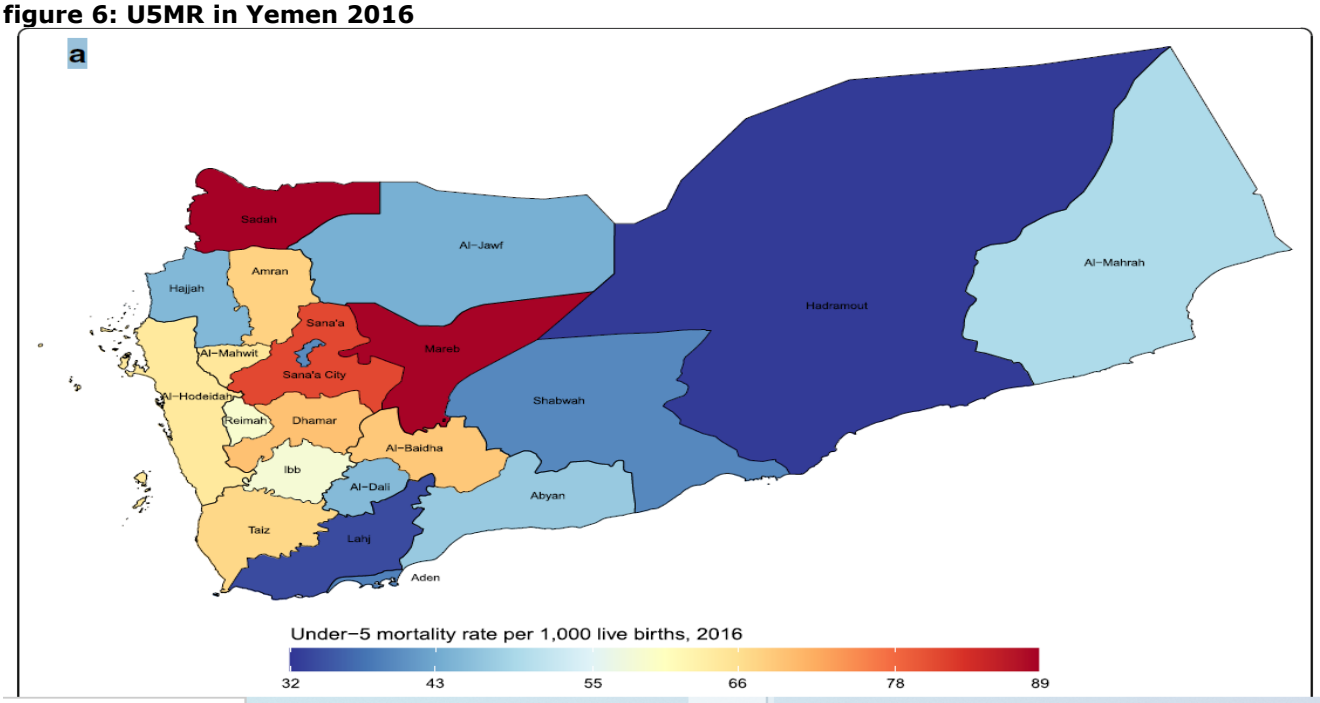
figure 5: Trend of U5MR according to MoPHP in Yemen



Source: Author's summary from **a** report from MoPHP, IMCI department

Another study estimated that the rate has increased from 54.2 deaths per 1,000 live births in 2010 to 83.9 deaths per 1,000 live births in 2017, more than 50% increase, and the rate will rise to 102.9 deaths per 1,000 live births in 2020(63).
Another report showed that in 2019, 140,000 deaths of children under-five were estimated and if the war continues, this will be 331,000 deaths in 2022[27]. Another study indicated that U5MR increased nationally between 2013 and 2016, ranging from 32,4 deaths per 1000 live births in Hadramout to 88·9 deaths per 1000 live births in Sadah(50), **figure 6**

figure 6: U5MR in Yemen 2016



Source: El Bcheraoui, Health in Yemen: losing ground in wartime(50)

The following conditions worsened during conflict:

- Malnutrition has drastically increased and resulted in 45% of deaths of children under-five(47).
  Chronic malnutrition in the country is very high, with an estimation of stunting and wasting, in 47% and 15% of children under-five, respectively[12]. One study found a high prevalence of GAM in two governorates, which is considered a critical phase(64). The number of children under-five, that is at risk of severe acute malnutrition (SAM) in Al-Hodeida alone, increased from 23,000 before 2015 to 100,000. Similarly, in Aden, the number of children at risk of severe acute malnutrition, reached 7700, compared to 3000 before the war(65). The rate of malnutrition in 41 districts was above 15%, exceeding the WHO emergency threshold(66). An estimated two million children are suffering from malnutrition, with 360,000 cases of SAM[19].

- Severe and moderate anaemia among children under-fives increased by 30.3% between 2013 and 2016(50).

- Low vaccination coverage is indicated as a serious problem. According to the last demographic survey in 2013, only 43% of children, age 12-23 months, received the basic vaccinations (three doses of pentavalent and polio vaccine, BCG, and one dose of measles vaccine). Still, 16% of children did not receive any basic vaccinations[12]. The vaccine coverage has remarkably decreased between 2013 and 2016 at the national level(50). Data indicated that between 2013 and 2016, the proportion of children that are fully vaccinated dropped from 38.2% to 22.4%[29]. This decrease is linked to the war as the reduction in immunization coverage was noticed more in governorates with armed conflicts, such as Taiz, Sa'dah, and Lahj. In Sa'dah, for instance, the vaccination coverage of Penta-3 decreased from 65.6% in 2014 to 49.9% in 2015, and Taiz from 92.5% to 73%(67).

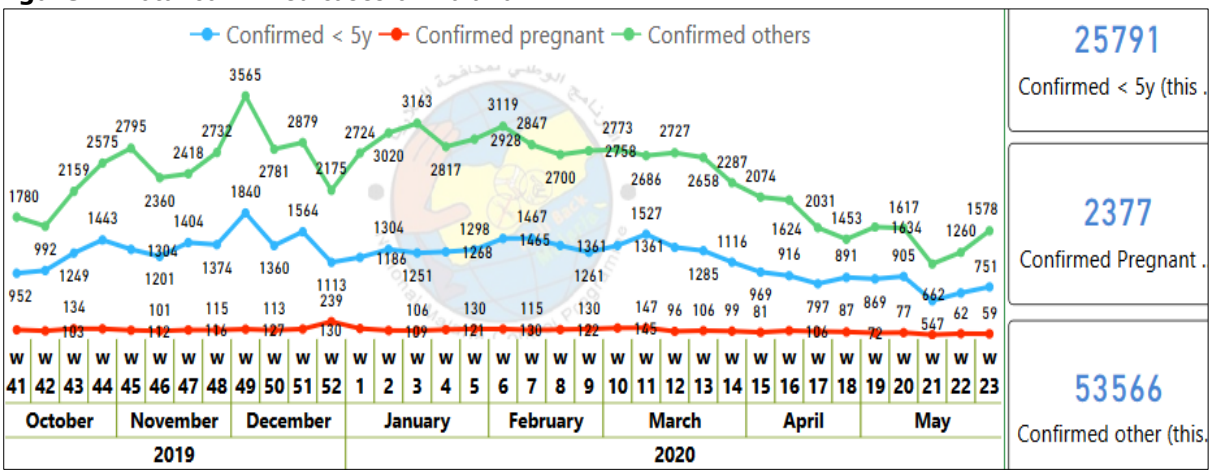
  Evidence suggested that measles and rubella vaccination coverage sharply dropped in a short period to 41%(68). In 2016, four measles outbreaks were confirmed with children under-five have been most affected. 61% of measles cases received no vaccination. The vaccination profile of the suspected cases in certain governorates revealed zero dose cases[32].

  Between August 2017 to August 2018, almost 2,203 diphtheria cases and 116 deaths were reported from 20 governorates with a CFR% of 5.3%[32]. In one study, almost half of diphtheria cases and 69% of deaths were among the unvaccinated group (69). Evidence suggested that vaccination coverage is severely affected by the war, which resulted in the current infectious disease outbreaks(69)(50).

- An increase in diarrhoea incidence among children under-five are reported (29). Also, the total number of suspected cholera cases was 1,246, 230 from 2018 to 2020 with children under-five constituting 26% of reported cases(70). The data analysis of an epidemic study revealed that 39% of the cholera cases were children under-five[31].

- Malaria cases decreased between 2010 and 2015 from 10.2/1000 population to 5/1000 population, then increased to 8.1/1000 population in 2016. This is due to the critical situation in the country caused by the war[32].
  According to the electronic system of the National Malaria Control Program (NMCP), the total confirmed cases of malaria of this year until May is 81,734 and children under-five represent 31.5% of total cases, **Figure 7.**

figure 7: Total confirmed cases of malaria



Source: malaria data of Yemen, eDEWS (http://th.nmcpye.org/)

3.1. Governance and leadership:

Governance can be defined as "encompassing systems of representation and citizen engagement, accountability, power, and institutional authority, ownership, political stability, and the rule of law"(71).

Governance and leadership are key components of IMCI implementation success or failure. The themes included in governance and leadership are policy, accountability, and management and coordination, and partnership.

3.1.1 Policy:

In several low and middle-income countries (LMIC), IMCI has been adopted as a part of the national health strategy, and it is mostly the main strategy for child health(45). Political support for IMCI plays an effective role in the institutionalization of IMCI in countries and widespread implementation. For instance, Tanzania achieved rapid coverage of IMCI because of the political commitment supporting the efforts to institutionalize IMCI. The Tanzania Essential Health Intervention Programme (TEHIP) was used to push the adoption of IMCI as a national policy(72)(73).

The Multi-Country evaluation and the 2003 Analytical Review indicated that scaling up IMCI as a comprehensive approach was exceedingly difficult in all countries, as planning and implementing the three components of IMCI were independent of each other. Most efforts neglected the community and system strengthening components and focused more on improving health worker skills (74)(75)(76).

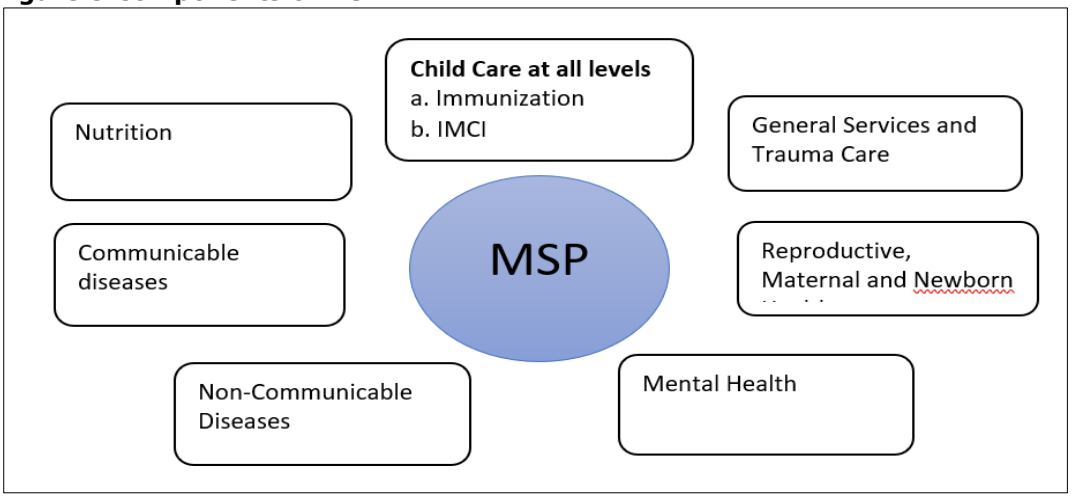
In Yemen, the National Health Strategy(NHS) 2010–2025 included responsibilities of MoPHP includes standards of health services, national guidelines as well as the organizational framework[36]. However, implementing the NHS was frozen by the events of 2011 and the war(77).

In Yemen, in 1999, IMCI was included in the Health Sector Reform Program's "Basic Benefit Package" and then it was included in the National Children and Youth Strategy 2005-2015. The new-born (0-7days) care is included in the IMCI guideline(45).
IMCI Implementation in Yemen was also piecemeal and gradually scaled up in the districts. In a study, the HWs did not recognise the meaning of C-IMCI due to negligence of the community component and the health system improvement. Furthermore, the outreach

activities and home visits were not comprehensive and mostly supplementing to the reproductive health services and immunization (57).
iCCM in Yemen was not incorporated in the national health policy, so action plans and guidelines were not available. Organizations such as Save the Children had to develop materials for implementation of iCCM using an already-existing CHV guideline and the guidelines of the specific disease like malaria. At the policy level, iCCM is associated with an ambiguous position in MOPHP regarding whether iCCM belongs to the nutrition department or to the primary health care department that created a challenge in coordination between implementers and MOPHP. Such a challenge induced one implementer to change the name of iCCM to be able to coordinate and start implementing(78). The respondents in KIIs confirmed that lack of iCCM policy created challenges in bringing funds, coordination, and implementation of the iCCM activities. The MoPHP does not approve the implementation of iCCM easily, because the program is not incorporated in its policy and external donors understand this challenge consequently, they refused to fund iCCM, when any organization proposed to implement it.

The Essential Services Package of Health (ESP), which was developed in 2004 and supposed to deliver comprehensive primary health care services, including health services for a child, is limited and not well defined. An analysis of several policies and grey literature in 2015 showed no evidence of progression in the implementation of the essential service package since 2004(79).
In 2016, amid the humanitarian crisis in the country, the health sector resumed attention on the ESP as a valuable tool to coordinate various external humanitarian health service providers. Several workshops, held by MoPHP and stakeholders, resulted in the "Basic Health Services Package" with nine components, and each component has a detailed list of conditions or interventions. A further list of top priority interventions was selected from the Basic Health Services Package based on the burden of diseases, cost-effectiveness, and capacity of the health system to deliver the services, named Minimum Service Package (MSP)(80). **Figure 8** shows the components of MSP.
With the support of WHO, the MoPHP has piloted the MSP implementation in four districts, and currently, based on KII, almost 3000 health facilities are covered with MSP services. The IMCI is one of the main interventions that included in the package(80)(81). Detailed components of MSP are attached in **Annex 4.**
In one study, the priority of interventions involved treatment of acute malnutrition and response to the outbreak, less attention was given to other essential primary services, while in other areas -away from the front-lines of the conflict- there was a wide range of child and reproductive health service[18].

figure 8:Components of MSP



Source: Author's summary based on Yemen Minimum Service Package (80)

According to KIIs, IMCI was extremely neglected by policymakers, and IMCI improved only because of support from international donors. One of the respondents said:" the IMCI program is not a new initiative, but it was neglected by policymakers in the MoPHP. Since the war in 2015, support from international actors resulted in improving the program and increased coverage in many districts".

3.1.2 Accountability and management

Among global and country-level partners, the fragmented IMCI leadership was reported as a challenge to implement IMCI in many countries coherently (82).
Strengthening district management capacity was an overlooked issue during IMCI implementation. In 2009 the WHO conducted training for managers at district levels on planning, prioritising, and monitoring IMCI activities. In IMCI survey, only 47% of countries adopted this training due to financial constraints(45). Evidence showed that problems in monitoring and supervisory mechanisms are associated with the sub-optimal practice for managing IMCI(83). Empowered district-level management was a critical issue for successful implementation of IMCI as in Kenya, Tanzania, and Kazakhstan, where successful implementation is achieved and training coverage was high due to strong district leadership(84)(82).
In Pakistan, on the contrary, poor planning, ineffective decentralization and lack of communication between implementers and policymakers led to ineffective implementation and limited coverage of IMCI(85).

Many countries had trouble managing IMCI in the context of competing priorities. In South Africa, a study found integrating IMCI into health programs was a challenge leading to fragmentation in the governance structures. The Expanded Program on Immunization (EPI) and the tuberculosis program received more attention and were not harmonized with the IMCI program(53). A report on 2016 strategic review of IMCI showed that the Global Action Plan for Pneumonia and Diarrhoea (GAPPD) or iCCM are new initiatives aimed to be complementary to IMCI, but they received more funding and support from donors "competing rather than complementing IMCI"(86). At district levels, the management teams faced difficulties with balancing competing programs that overlapped with IMCI, where some of the programs received better resource and reporting than IMCI(86).

In Yemen, one study showed that an inadequate integration between IMCI and other programs, including immunization, nutrition, and malaria control programs, led to poor implementation of IMCI, with HWs reporting inflexible rules and diverse work due to lack of the integration(57). The key informants confirmed the fragmentation of IMCI. Many programs with independent management exist in the MoPHP, such as nutrition, malaria, and EPI programs. There is a breakdown of child health and newborns into two separate programs. While child health is within IMCI, newborn health is integrated with maternal health in one program.
Lack of a unified structure for iCCM in the MoPHP is also an issue raised by respondents.
In 2015, the supervision and technical committee was established as a first step to start the implementation of the iCCM strategy. This committee was responsible for all activities, related to CHVs, with a membership of IMCI, Nutrition program, MNCH, and the health education center. A dispute between the IMCI program and the nutrition program caused the IMCI program to withdraw from iCCM implementation. In 2016 a technical unit was established under the Primary health care sector called "Community health workers unit" to provide services through the community health workers (CHWs) in collaboration with UNICEF as a major funding agency for iCCM. Currently, there are CHVs and CHWs providing community services for children under-five. CHVs are managed by the NMCP and CHV program, while CHWs are managed by the nutrition program and Community health workers unit. Both are supported and funded by UNICEF, except for the malaria component, provided by CHVs, which is funded by the Global Fund to Fight AIDS,

Tuberculosis and Malaria (GF). **Table 3** shows the major differences between CHWs and CHVs.

Table 3: Some differences between CHWs and CHVs

CHW	CHV
The CHWs received training for 62 days on IMCI guidelines and focusing on child and maternal health, malaria, communication for development, surveillance, and referral	The training is carried out for six days, focusing on malaria and malnutrition, on providing diagnosis and treatment services for these two conditions.
CHWs are selected either from staff who serve in the nearest health facility or from CHVs from the community after completing the 62 days training	CHVs are selected from the community from 2 to 3 catchment areas of health facilities
CHW received a monthly salary	CHVs do not receive any salaries. They motivated through a quarterly meeting where each CHV receives a per-diem for five days only.
Supervising: UNICEF, Nutrition, and MNCH	MoPHP supervising programs are NMCP and Nutrition program.
Funded by UNICEF and EU	Funded by GF, IOM, and WHO

Source: Author's summary based on KII

Poor planning, rushed implementation, combined with a lack of clear pro-equity criteria led to areas with high U5MR were not prioritized and low coverage of IMCI(82). Furthermore, Child Health Programme Management Training was not introduced; also, there are no tools for bottleneck analysis & Strategic Planning (45).

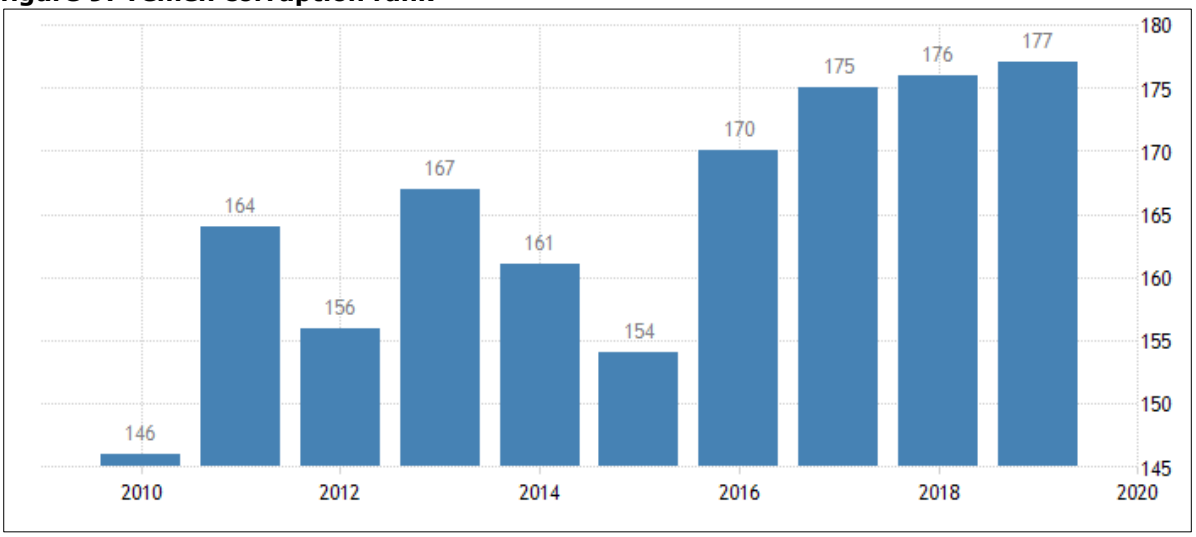
According to KII, a continuous change in the management team of the IMCI program is also an obstacle to the implementation of the program. For instance, program implementation suffers from periodic changes of the management team in the MoPHP as policy regarding the provision of treatment and drugs by CHWs was changed at the inception of a new manager, limit CHWs' services to only screening and referral. It took time and effort to convince the new team about the benefit of CHWs. This made the implementing NGO continue the implementation with approval and coordination with GHO/DHO but not with MoPHP.

Giving less authority to the managers of the IMCI program in the MOPHP is another factor affecting the implementation of IMCI activities. Decisions made by these managers are mandatorily subjected to approval by the Minister of Health, which slows down the program and induced some managers to resign from their positions. One respondent said: "in the last two years almost five managers were assigned for the IMCI program, two of them have quitted because they feel they lack authority and ability to make any decision regarding improvement or IMCI activities".

Another obstacle cited by respondents is poor decentralization. The GHO and DHO cannot implement any activities except after approval from the central level, which is not easy to get. Respondents also stated that the MoPHP is not aware of the needs at the district level, and when GHO/DHO informed policymakers at a central level about their needs, there is no response.

In general, significant governance weaknesses and corruption was a problem indicated by governance assessments even before the war(87)(88). According to the Corruption Perception Index, Yemen before the war ranked 154. After the war, the corporation has increased significantly, putting Yemen 177 out of 180 countries in 2019(89), **Figure 9.**

figure 9: Yemen corruption rank



Source: transparency international (89)

3.1.3 Coordination and Partnership

Lack of coordination at a global level was reflected by the development of several newborn and child health strategies and guidelines such as Integrated Management of Pregnancy and Childbirth (IMPAC), Every Newborn Action Plan (ENAP), Helping Babies Breathe (HBB) and GAPPD(82). The three components of IMCI were planned and implemented unevenly, and in a way that lacked synergy, for instance, the health worker training was supported by bilateral agencies, health systems strengthening was funded by the government while iCCM/ C-IMCI was supported by UNICEF and NGOs(82)(76).
In Peru, poor coordination among implementing partners in which districts and what time of introduction the community and the facility components needed resulted in ineffective implementation and loss of synergy(90).

In Yemen, before the war, several local and international NGOs provided specific health services in different governorates, mainly in urban areas[36].
At the beginning of the war, as health system governance collapsed, the humanitarian response was quickly planned by the WHO, MoPHP and 20 organisations and formally led by MoPHP(91). Yet, coordination and timelines of the humanitarian response have been undermined, as most of the international staff evacuated from the country for security reasons (92).

The United Nations set up the health cluster, consisting of United Nations agencies, local and international NGOs to respond to the emergency in the country. Almost 71 health cluster partners, coordinated by the WHO, provide training and incentive for HWs besides operational support and medical supplies, reaching 2512 health facility as of March 2020 (93). One study revealed that Health and Nutrition cluster manages the humanitarian response efforts, and they are responsible for resource allocation, defining strategies and priorities[18].

According to a study in two governorates, coordination of iCCM was also problematic at different levels between iCCM implementers, MOPHP, GHO, DHO, as well as between health facilities and CHWs. In one governorate, coordination was extremely complicated due to the conflict in the country; it induced DHO representatives to be displaced(78). Two Ministries of Health exist in the country, so the same implementer must coordinate with one of them or both depending on where is the IMCI/ICCM implementation (78). The

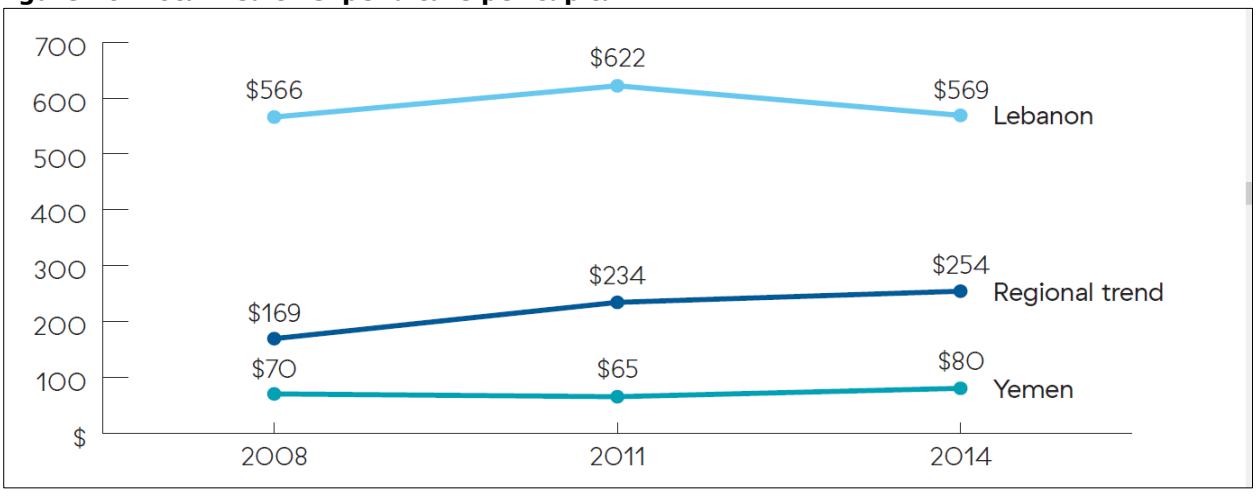
respondents from GHO confirmed the difficulties in coordination between MoPHP and GHO/DHO. At the same time, respondents from NGOs confirmed the difficulties of coordination in one governorate half of its districts managed by MOPHP in the south, and the other half are managed by MoPHP in north. This situation creates a challenge in coordination as every ministry has its vision and strategies.

3.2 Financing

Domestic financing is critical to demonstrate the commitment and leadership of the government. At the global and country-level, funds required for IMCI scaling up are not sustained nor coordinated very well. In a global survey of IMCI, the government is the main funding source for most activities of IMCI including, salaries, monitoring and supervision, and equipment, while partners fund the training and per diem, but countries with a high U5MR depend more on donor support(45). The budget for training was reported to be a major obstacle to implement IMCI at both national and district levels. The supply chain lacked a dedicated budget line and was reported among barriers to implementing IMCI(94)(45). Issues of financing and sustainability are reported in iCCM survey of 42 countries in Africa, with only nine countries have a distinct budget line for iCCM while the other countries depend mostly on the donors to provide funds even for CHW's salaries(95). In other countries' analyses, both IMCI and iCCM initiated and continued to be donor-led initiatives. Usually, donors start funding but do not continue financing IMCI scale-up that resulted in undermining the sustainability of the program(82). In Kenya, international funders initiate the program but without commitment to continue to scale up funding(96). For iCCM, flexible funding was also reported to be a challenge, particularly in emergency settings. In South Sudan, iCCM was a developmental program, and during an emergency, the donors refused to support a development-focused program like iCCM that resulted in an interruption of medicines and equipment to CHWs during the emergency(97).

Yemen is a signatory to the Abuja Declaration that committed governments to allocate at least 15% of GDP to health(98). Before the war, the health sector funding in Yemen was not really in line with health needs, irregular and not fairly distributed[36].
According to the WHO National Health Account of Yemen, the government gradually reduced its contribution to health expenditure from 4.13% in 2007 to 3.7% in 2001 (99). Similarly, another report showed a decrease in total health expenditure (THE) from 50% in 2000 to 23% in 2010. This reduction is due to problems in economic performance(47). With the decline of public sharing, out of pocket (OOP) is exploding to reach 81% of THE in 2015 (99). **Figure 10** shows that Yemen has the lowest THE per capita compared to other Middle East and North Africa countries (100).

figure 10: Total health expenditure per capita



Source: Health Trends in the Middle East and North Africa: A Regional Overview of Health Financing and the Private Health Sector (100).

The health financing system, before the conflict, was fragmented and dependent on OOP spending, due to weak economic and poor governance [35][28].
Since the beginning of the war, providing basic health services, including malaria, tuberculosis, and immunization services, relied extensively on donor support (79)[28].

The Yemen Humanitarian Pooled Fund (HPF) is developed to finance the Humanitarian Response Plan. HPF is managed by UNOCHA and includes donors, UN agencies, and national and international NGOs as members(101).
The WHO faced a gap of 80% in 2015 for its activities in Yemen and only less than half of the UN's 2016 response plan was funded(102)(103). Similarly, the United Nations reported that the funding reduced in 2019, and only three programs are funded for the whole year, among 34 major UN humanitarian programs (104).
In March 2020, the United States, the second source of funding after Saudi Arabia, started partial downsized of its funding for humanitarian assistance in the north country because of Houthis obstruction behaviors [16].
MoPHP faced a financial crisis, with no operational budget, supported by the Ministry of Finance and salaries are paid irregularly, resulting in more collapse of health services(105)[31]. In one study, officials from MOPHP lamented the unwillingness of donors to pass funds through government, which enables them to implement their plans [18].
In Yemen, IMCI is not only heavily reliant on donor funds but also the program lacks a government budgetary line for supervision and supply chain(45).

Issues of sustainability and lack of government support was also raised during KIIs. All respondents confirmed that all activities of IMCI and iCCM are completely funded by external donors, with no budget line in MoPHP for both programs. Since the beginning of the year 2020, there are downsizing in funding, leading to delay in the implementation of activities, especially in the northern regions. There is a multiplicity of donors with a different amount of funds. When the donors approve to fund iCCM, to be implemented by NGOs, iCCM is usually part of a large project, so the fund allocated to iCCM is limited relative to its needs, such as drugs, training, incentives to CHWs.

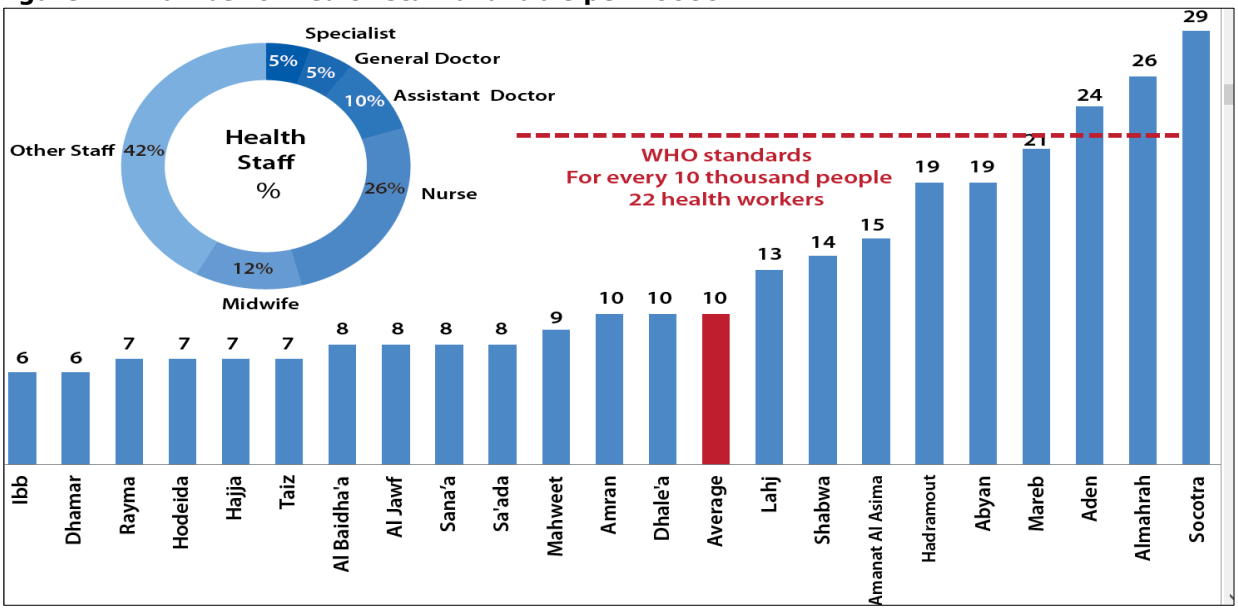
3.3. Workforce:

Many studies in different countries mentioned poor supervision, lack of follow-up after training, short duration of the training, and high cost of training as factors affecting the performance of HWs. Studies found that the 11-day IMCI training was not enough to gain all needed skills. The training is also expensive, logistically tough, and HWs must leave health facilities during training. The supervision after training was inadequate due to insufficient funding or lack of trained supervisors(106)(94). Barriers of supervision, at various levels, were reported for several reasons, such as too long checklists, workload, lack of standard methods, and poor decentralization(107)(108). Lack of refresher courses, poor support supervision, and hierarchical tensions between supervisors and HWs are obstacles reported and resulted in the demotivation of HWs (109). Similarly, in the IMCI survey, human resources were the most important challenge, including staff turnover as a major barrier. The survey also identified inadequate quality and quantity of staff, staff retention, and unpaid volunteers as barriers to IMCI implementation. Only 20.7% of countries surveyed provide a salary for CHWs(45).

In Yemen, the MoPHP lacks a comprehensive plan on human resource development and planning. It also does not have a reliable database for human resources. The Ministry of Civil Service is the one that is responsible for the selection and allocation of human health resources [36].

The motivation mechanisms and distribution of the workforce over the urban and rural areas were not taken into consideration[36]. Retention, dual job-holding in the private and public sector, and internal and external migration of HWs were reported as problems even before the war (110)[35].
Since the start of the war, many HWs moved away from their duty station because of lack of salaries, insecurity, or access problems(111). In one study, staff turnover was linked to economics, as either HWs move to private for higher salaries in programmatic positions or looking for employment outside the country(18). According to Health Resources and Services Availability Mapping System 2018 (HeRAMS), on average, only ten HWs per 10,000 people are available while the standard of WHO during an emergency is 22 HWs per 10,000 people. **Figure 11** illustrates the number of health staff per 10000 population in several governorates. Out of 22 governorates, only three meet the WHO standard (112).

figure 11: Number of health staff available per 10000



Source: Health Resources and Services Availability Mapping System 2018 (HeRAMS)(112)

An indicator of the 60% threshold of trained HWs in the first-level health facility is used as an indicator to measure the training of IMCI(113). Yemen is one of the countries that have 24- 49% of health facilities having a minimum of 60% of HWs trained in IMCI(45).

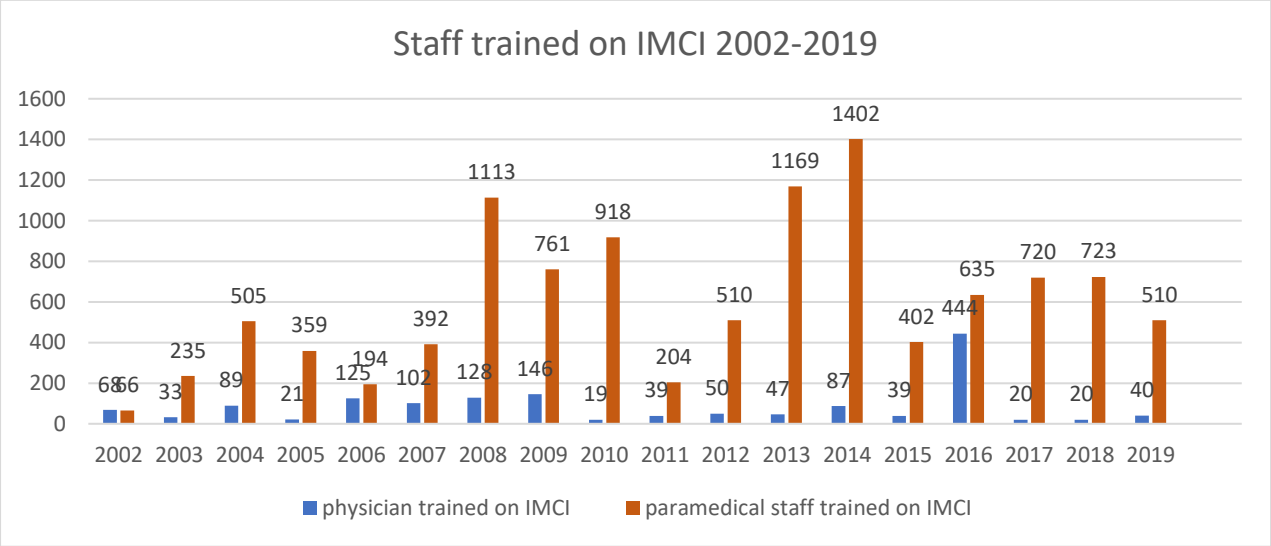
IMCI in Yemen experienced a high staff turnover at different levels, health care providers who trained on IMCI do not receive an adequate follow up to ensure good quality of IMCI services. Irregular, sporadic supportive supervision was reported, and CHWs do not receive salaries nor incentives (45).

In another study in Yemen, the regular supervision visits were every six months to once a year, and the first follow-up visit was three months after training. The HWs believe these visits were not effective and had no feedback (57).
For iCCM, CHWs reported poor supportive supervision with only concern about reports. Lack of effective supervision is due to lack of knowledge about iCCM in DHO and lack of qualified supervisors. Distance, the difficult landscape of many villages, and the insecurity in the country limited regular supervision(78). Training of CHWs in iCCM was a challenge. The budget for training was not in line with the actual need for training as the limited number of CHWs with medical background demanded to change recruitment criteria and provide additional training. The shortage of qualified trainers was a problem, and

competent trainers refused to travel to other districts, where CHWs provided services(78). In Taiz, one governorate where iCCM was implemented, CHWs were unfairly distributed with some villages having 4-5 CHWs, while others have no CHWs(78). Respondents confirmed this during KIIs. One iCCM program manager said: "inability to find and recruit CHWs was the main cause that iCCM was not sustained in Taiz Governorate".

The number of physicians and paramedical staff trained in IMCI has been affected by the ongoing war. The number of staff trained on IMCI was increasing through the years from 134 staff in 2002 to 1498 staff in 2014. The figure dropped significantly after the war (44), **figure 12.**

figure 12: Staff trained in IMCI (2002-2019)



Source: Author's summary of a report from MOPH, IMCI department (44).

According to KII, Training for IMCI and iCCM is coordinated and facilitated by GHO. Respondents from NGOs reported that the training for IMCI and iCCM was suspended only during COVEID-19. While respondents from MoPHP stated that the training was suspended for more than a year ago except for NGOs' interventions that include training of HWs. Policymakers decided on training suspension at central levels because the training is costly as well as the priority is given to support health facilities with drugs and equipment. One respondent said: "At the policy level, the IMCI training is considered to be a waste of money and it is better to use this money for drugs and equipment".

According to the supervision plan, supervision takes place quarterly each year at the governorate level and monthly at the district level. Supervision differs among NGOs and MOPHP. NGOs reported regular supervision visits to health facilities and CHWs despite the road difficulties and distribution of CHWs in remote areas. Some respondents from MoPHP stated that the challenges related to the cost of supervision and lack of vehicles resulted in reducing the number of supportive supervisions to once a year instead of four. The supervision for CHWs and CHVs is implemented through a joint team from different programs.

There is no official recruitment since the start of the war. In the current situation, the GHO contracts with new staff if there is any need and the implementing NGOs give them an unequal rate of incentive. When funds subside, incentives of HWs stop, so they leave searching for other jobs.
The work of CHVs does not fall within the structures of the official job, so they do not receive any incentive. They are motivated in a quarterly meeting where each CHV receive a per-diem of 5 days, while CHWs receive a regular monthly salary.

Motivation and retention of the HWs are challenges because of irregular or non-existing salaries, leading to discontinuing providing of services.

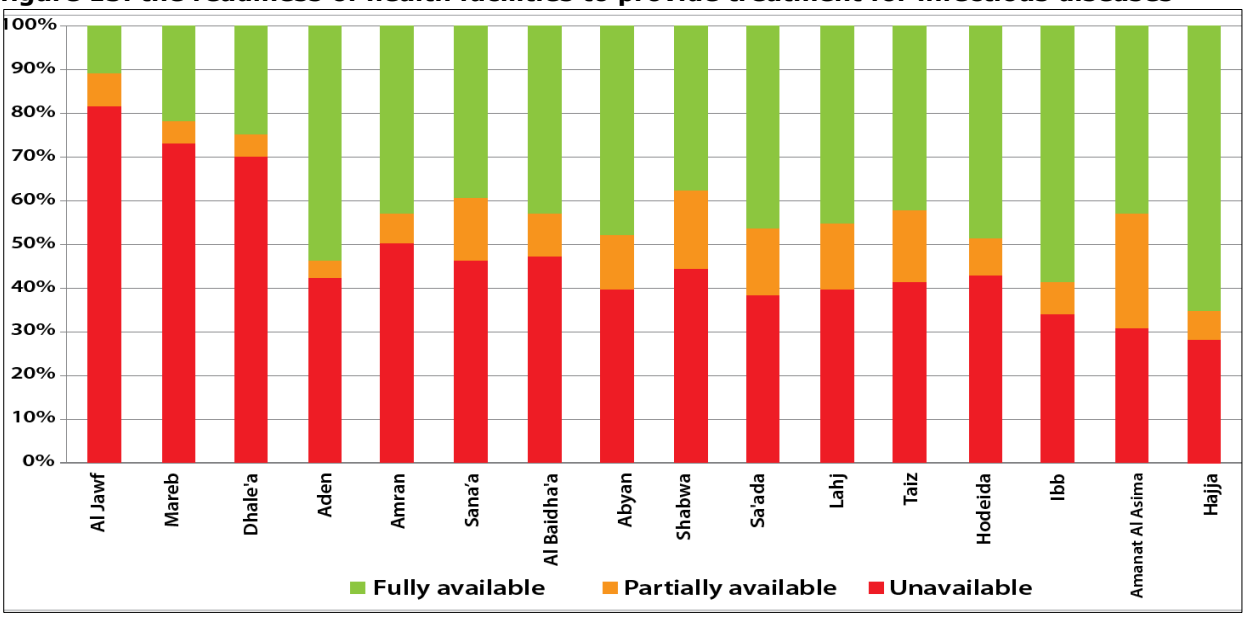
There was a gender issue. Donors and implementers asked for gender balance in the selection of CHWs, but MoPHP refused that as male CHWs will not be accepted in a conservative community like Yemen, so only female CHWs have been selected.

3.4. Medical technology and supply:

Studies in several countries reported a lack of medical supplies, such as essential drugs, growth monitoring commodities, charts, and vitamins due to weak management of the centralized drug dispensing system(109)(55).
In Afghanistan, a shortage of drugs for CHWs and health facilities was a challenge. The drug supply lasted for only one month instead of 3 months. People lost confidence in the whole service provided when CHWs referred ill children to health facilities to get drugs, and the health facilities suffered stockout(114).

In Yemen, since the war, the health system experienced severe shortages in medical supplies and essential drugs, with difficulties in the transportation and procurement process. Additionally, lack of fuel, power, and water and inadequate logistical resources for essential health programs, contributed to the disruption of health services(47).
In Yemen, According to the HeRAMS survey in 2018, only 50% of health facilities assessed are functioning, 35% are "partially functioning", and 15% are classified as "non-functional"(112). The preparedness of health facilities to treat infectious diseases has been affected during the war, with only 43% of health facilities providing services for treating communicable diseases. **Figure 13** showed the level of readiness of the health facility to deal with communicable diseases. Three governorates are at an alarming level, with 60% of health facilities not able to treat such diseases(115).

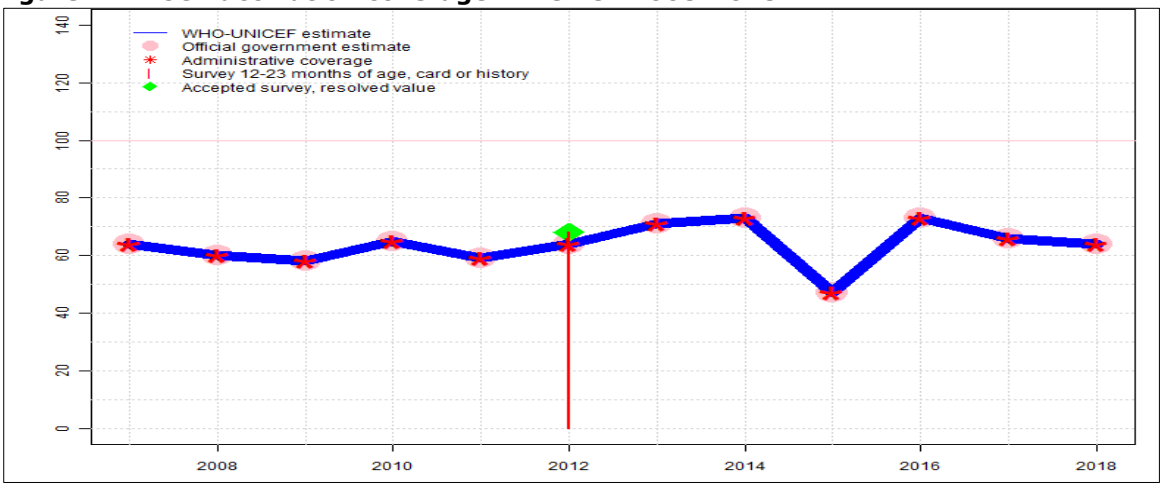
figure 13: the readiness of health facilities to provide treatment for infectious diseases



Source: MoPHP and WHO, Service Availability and Health Facilities Functionality in 16 Governorates, October 2016 (115)

The national vaccinetion campaigns and EPI have been interrupted, leaving many children at high risk of infectious diseases. In 2015, a six-month vaccine stock-out at the national level resulted in a significant BCG vaccine coverage decline. The recovery from the stock out and the vaccination outreach activities helped to improve the vaccine coverage in the next years(116), **Figure 13.**

figure 14: BCG vaccination coverage in Yemen 2008-2018



Source: Yemen: WHO and UNICEF estimates of immunization coverage: 2018 revision

Health cluster actors provide essential drugs, water, fuel, supplementary kits to various health facilities at the primary and secondary levels(117).

One study in Yemen found the supply of free IMCI drugs insufficient despite the availability of these drugs at the central level. According to the study, the problems in the supply chain included "intermittent supply; supply of drugs that were about to expire; supply of drugs not proportional to the real needs; or the supply of tablets instead of syrup. Most facilities were run with only a few types of drugs"(57). The same study also found deficiencies in the essential equipment such as mothers' counseling cards and thermometers (57).
For iCCM, shortages of drugs were reported as a major challenge in several districts. Several reasons imply the shortage of drugs during implementation including the budget of drugs in the proposal did not reflect the actual need so few drugs were available during implementation. Other reasons are delays in the arrival of the drugs after ordering from international sources and Consuming drugs in health facilities before distributing these drugs to CHWs. The program had insufficient support from the government. At the district level, DHOs did not contribute to compensate for such drug deficiency as they suffer from stock-out(78).
Roads are blocked during conflict escalation leading to disruption of the supply chain at all levels national, government, district, and CHWs(78).

According to KIIS, all the supplies are provided by donors to MoPHP then to GHO and DHO and Health facilities, and CHWs. Sometimes the supplies are provided directly either to GHO/DHO or to health facilities or directly to CHWs. During IMCI and iCCM interventions implemented by NGOs, the health facilities and CHWs depend totally on NGOs to provide drugs. One respondent said, "The drug supplies depend mainly on the organization's support. When the fund ends, no one supports the CHWs with medicines to continue providing services".

Government obstruction in import, like clearance procedure, and difficulties in moving supplies within the country is one of the main challenges that lead to drug expiration before reaching the planned destination.
A delay in receiving the internationally ordered drugs, which might need six months to reach, made some implementing NGOs arrange for their buffer stock, with appropriate storage capacity. The DHO sometimes helps to implement NGOs in providing some drugs, such as ORS and nutrition supplements, when they suffer from drug deficiency. The DHO does not share with the implementers their list and quantity of drugs, because the DHO might be afraid of losing the support from the implementers.
Existing malaria control units in districts are reported to be an enabling factor to support CHVs with antimalaria drugs. In malaria's absence control unit, the supply is carried out through the branch of the NMCP in the GHO, which has a buffer stock of medicines to supply CHVs. CHWs are not provided with antimalarial drugs. One reason for that is the some DHO refused to provide CHWs with antimalaria because they don't believe in the authorization of CHWs to prescribe drugs. Another reason is the NMCP does not participate in the management of CHWs.

Deficiencies and irregularity of essential drugs, especially antibiotics, were reported by all respondents. Other supplies such as ORS and nutrition supplements are available in appropriate quantities. The supply of CHWs with essential drugs to treat diarrhea, pneumonia, and malaria was questionable "How the drug supply is working for CHWs while the health authorities are struggling to afford the essential antibiotics for the health facilities?". Another respondent confirmed that CHWs go house-to-house without essential drugs.

Lack of equipment such as thermometers, absence of electricity, lack of vehicles needed for supervision visits, and shortages of computers needed for information management are all issues mentioned by respondents.

3.5. Information system:

The IMCI Survey indicated that only 30 countries out of 91 have a comprehensive monitoring and evaluation plan for IMCI and among countries with a high U5MR only 15% reported having such a plan. Usually, monitoring and reporting of IMCI have been conducted intermittently(76). For instance, in Burkina Faso, due to inadequate monitoring, the stock out of IMCI drugs was not recognized until an independent assessment identified such a problem(118). In another study, only some datasets of IMCI indicators were shared from the sub-district level to the national level. However, the data shared never resulted in any action or feedback(53).

In Yemen, before the war, follow up and evaluation activities have not been included in health plans because of limited funds. Programs that receive external support, such as malaria, TB, and vaccination, had a data collection system, but the flow of data from service level to the center was infrequent. Donors and implementers ignored the health system of the MOPHP, and they had their own information system[36]. In nutrition programs supported by UNHCR, during the growth monitoring of refugees at the camp-level, the percentage of children with acute malnutrition entered HIS irregularly(119).

The Electronic Disease Early Warning System (eDEWS) was introduced in 2013 to detect outbreaks. It was integrated with the national integrated surveillance system to form one system called the electronic integrated disease early warning system (eIDEWS). eIDEWS uses mobile cellular software to collect data and generate alerts to ensure timely data analysis of 31 infectious diseases, including those of childhood diseases. The reporting of this data takes place through the weekly epidemiological bulletin providing an overview of the burden and mortality of diseases(120).

During the pilot phase in 4 governorates, eDEWS successfully detected four outbreaks. (120). With the situation of ongoing conflict, eDEWS was able to detect and alert about cholera cases during a cholera outbreak, although timelines of the response require improvement (121). Another study showed that eDEWS detect and alert the diphtheria outbreak in the country; however, the official statement of the outbreak was late by 34 weeks (69).
The performance of the Integrated Malaria Surveillance System (IMSS) was poor because of the collapse of the reporting system, due to the suspending of the GF budget. IMSS has a low coverage rate with only 75% of public and 29% of private health facilities having this system, while eDEWS has a high coverage rate, 96% in public, and 46% in private health facilities (122).

According to some respondents highlighted that the data collected are not complete with the irregular flow at different levels. Only 45% of all services provided in the health facilities are reported. Sending data and reports through mobile phones are reported as an effective way for data flow, especially in remote areas. It is associated with inaccuracy during data entry.

Each NGOs has its own HIS system and database. The NGOs share reports quarterly with the health cluster. Some respondents stated that the NGOs use the same health facility records, while others cited that the NGOs have their own records with different indicators that donors asked for. The emergency response in the country also requires reports for specific indicators to be filled instead of that provided by MOPHP because the last are long and have a lot of details. The indicators for IMCI are not constant among different stakeholders, except for the nutrition program.

Some respondents mentioned the absence of a mechanism to monitor and evaluate IMCI implementation as an obstacle. Others confirm that an external evaluation of some programs, implemented by NGOs, are done when donors request that. Respondents working in NGOs stated that they have competent personnel working in HIS. In contrast, respondents in MoPHP cited that policymakers focused less on HIS resulting in many challenges, such as lack of training in information management, low retention to personnel working in HIS, and lack of skills in data collection, verification, analysis, and interpretation.

Respondents from NGOs agreed that the data is mostly used for fundraising and to guide them to more interventions, and while respondents from MoPHP believe that the collected data is not used.

3.6. Service Delivery:

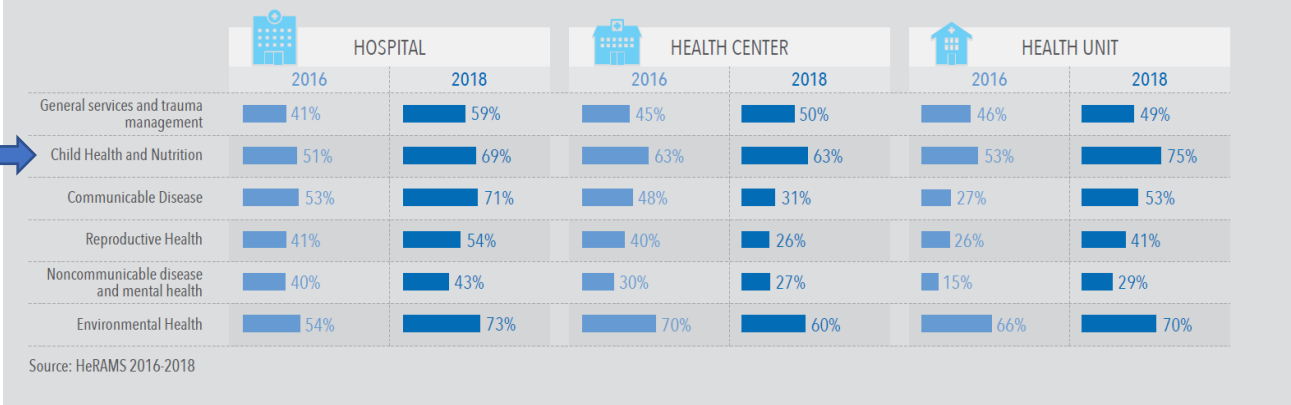
3.5.1. Service Provision and quality of care.

In a study of 4 sub-Saharan African countries, even with nationwide training in IMCI, HWs failed to recognize serious signs and symptoms of childhood diseases(123). Similarly, another showed that few HWs assessed over 80% of children correctly and neglect to check for malnutrition signs and to advise on feeding practices(106)
One study also highlights the general under-appreciation of curative and preventive aspects of IMCI by nurses (53). Weak performance and poor adherence to IMCI guidelines have been reported in different countries due to long IMCI consultation and long waiting time for patients, leading to avoiding steps in IMCI guidelines and improper IMCI implementation. Poor remuneration and physical overload also contributed to poor adherence (124)(125)(109)(53). IMCI services availability in South Sudan was poor, with only 16% of health facilities provide growth monitoring, child immunization, and

consultations. The utilization of these services was also poor, and the IMCI guidelines for assessing sick children was implemented in only 6% of assessed facilities (126). In another study in South Sudan, the low adherence of HWs to IMCI guidelines showed sick children suffering from cough were managed inadequately(127).

In Yemen, although the health situations continue to deteriorate, the availability of child health services at health units, health centers, and hospitals have improved compared to other components such as reproductive health, mental health and non-communicable disease (128), **figure 14**

figure 15: Child health service availability (2016 vs 2018)



Source: Yemen humanitarian need overview (128)

As mentioned above, the MSP package includes IMCI services that are provided at different levels. According to the KIIs, four types of community care providers deliver MSP services in the community, including CHWs, CHVs, community midwives, and nutrition volunteers. **Table 4** shows how IMCI is provided with other services as a package at different levels.

table 4: MSP services provided at different levels including IMCI

Community	Home (CMF, CHVs)	Home visits, Information, Education, and Communication (IEC), home deliveries.
	Community facility (CHW, CHV)	Limited curative care, IEC, SAM screening, and management. Family planning (FP) (condoms)
	Mobile Team	Limited curative care including IMCI, ANC/PNC, EPI, SAM screening and management, FP (short-acting methods), IEC
Primary Health Care	Health Unit	Limited curative care including IMCI, ANC/PNC, EPI, SAM screening and management, FP (short-acting methods), IEC. Refill of NCD prescriptions.
	PHC Centre	Curative care (OPD) including IMCI, TB, and others, ANC/PNC, FP, EPI, SAM screening and management, NCD management. Normal Deliveries (selected facilities). Essential Newborn Care. Basic Laboratory.
Hospital	District Hospital	Curative care, including OPD and Inpatient. Round-the-clock ER. IMCI, TB, NCD. ANC/PNC, Normal and complicated deliveries. BEmONC (selected facilities). EPI. SAM with medical complications. Basic laboratory. Essential Newborn Care + management of sick and LBW newborns (selected facilities
	Inter-District Hospital Governorate Hospital	Curative care, including OPD and Inpatient. Round-the-clock ER with trauma care, IMCI, TB, NCD. ANC/PNC, Normal and complicated deliveries. BEmONC and CEmONC. Essential Newborn Care + management of sick and LBW newborns. EPI. SAM with medical complications. Laboratory and Radiology.

Source: Yemen Minimum Service Package (80)

CHWs and CHVs differ in the type of services provided. In an iCCM project implemented by one NGO, CHWs were trained to provide treatment for uncomplicated pneumonia malaria, malnutrition, and diarrhea. CHW covers an area with a total population of 1000 or 170 households. The number of CHWs in targeted areas will depend on the size of the population in the villages.

According to KII, CHVs provide services mainly in nutrition, malaria treatment, and promotion activities. **Figure 15** shows the services that should be provided by CHWs.

Figure 15: service provided by CHWs

Source: Community Health Workers –Sana'a Field Office (129)

In Yemen, one study found that there is an inadequate working environment to implement IMCI activities. Buildings of health facilities were old, ruined, or lacked furniture and commodities. Lack of water and electricity was the worst aspect, resulting in difficulties to prepare oral antibiotics and oral rehydration solutions. Counseling was not conducted effectively, due to the high workload, short time for personal counseling, and overcrowding. Overload was emphasized by health workers, as they must complete a sizeable amount of papers and reports. One health worker said, "Sometimes we feel we can work better without IMCI" (57).
In KIIs, some respondents reported that health workers show high adherence to IMCI guidelines, especially after training, while others reported that multiple services related to other programs are assigned to health workers are causing confusion and leading to inadequate implementation of IMCI activities. The shortage of drugs and irregular supportive supervision led to poor performance.
The respondents also cited that there is a limited implementation of IMCI in hospitals. One reason for this might be the physicians and specialists in the hospitals do not believe in the IMCI guideline; they believe they have enough experience to diagnose and treat childhood diseases without using IMCI guidelines.

3.5.2. Access, Utilization, and community participation

Trusting CHWs is an important factor to improve the utilization of services. Studies in other countries showed that there is a high level of satisfaction and appreciation toward CHWs services, being accessible and affordable, and meeting community needs (130). During the crisis in South Sudan and regardless of some challenges, such as drug stockouts and staff shortage, CHWs were the main providers of child health care and provided

treatments for sick children (97). However, in Afghanistan, caregiver interviews in the national sample of facilities revealed that only 20% of people were aware of CHWs and their services. Concerns also raised regarding illiteracy and competency of CHWs (130).
Community support plays an effective role in the success of program implementation in several countries. For instance, the community has participated in post-construction, covering the training cost of CHWs, transport cost, and security of CHWs (130)(131)(114).

In Yemen, direct attack and damage to the health facilities, combined with impaired supplies and health workers shortage, are creating challenges to access public health services (132)(115).

The coverage of iCCM is still limited geographically. Yet, the services provided by CHWs were valued as they provide services in remote areas even during the conflict and some time to camps for internally displaced people. Some communities did not accept CHWs as they have no medical qualification; drug stock-outs resulted in further loss of trust in CHWs. Social mobilization, including meeting with community leaders and community members was effective to solve this problem(78). Access and traveling of CHWs to neighboring villages become a challenge during conflict escalation or rainy season as roads blocked (78). Basaleem (57) revealed that community participation varied from weak to effective, and the sense of community ownership was developed in one district where the community had participated in building the health center and donated the resources. According to KIIs, the community has a limited role in iCCM program as the selection of CHVs is the only activity that the community sometimes participates in.

3.5.3. Referral system:

Basaleem(57) found inappropriate referral during the IMCI implementation as the parents moved to the higher level of the health facilities themselves "self-referral". In another study, many challenges related to the referral process occurred during the implementation of iCCM program(78). There was no integrated referral system with a lack of connection and communication between the health facilities and CHWs. Neither the CHWs referred a sick child with a referral form nor the health facilities provided feedback to the CHWs to follow-up the case. Also, the referral health facilities cannot manage referral cases because of shortages in the essential drugs and equipment. Families are poor and could not afford the cost of transportation when a sick child has been referred(78).
According to KIIs, the referral system from health units and health centers to a higher level is not functioning.

Chapter Four: Discussion

This study focuses on several interconnected contextual factors that influence the IMCI and iCCM implementation and these related to the governance and leadership, finance, information system, health workforce, and supplies. In light of Van Olmen framework, applying the function blocks in analysis issues of IMCI and iCCM programs allowed to detect specific elements in a broader health system deficit and identified causes behind their existence. That might help to design a coherent strategy to manage childhood illnesses and achieve desired child health outcomes. This study found the governance and leadership as the most dominant factor affecting the implementation.

This study showed poor implementation and slow scaling-up of both IMCI and iCCM in Yemen, reflecting a larger problem in policy commitment. Poor policy commitment was evidenced by the absence of a budget line of the IMCI program in the MoPHP and the slow expansion of the implementation taking years. 93% of districts covered by IMCI services were achieved only after 16 years and implementing iCCM took place only in 2017 due to the international community response to the crisis in the country. This is similar to the situation in Nigeria and India, where there was a slow actualization of IMCI tied to a lack of government commitment and funding (82). However, this is in contrast to Egypt and Kazakhstan, where their government showed a high level of commitment to IMCI by establishing a well budgeted IMCI program associated with advocacy efforts and engagement of a district management team resulted in a rapid IMCI scaling up and significant reduction of U5MR (133)(82).

This study shows that iCCM policy in Yemen has developed in an ad hoc style and presented as multiple policies, including CHWs policy and CHVs policy. Similar to other findings in six Sub-Sharan Africa, where iCCM was not a standalone policy(134). For any new global policy like iCCM, each country, with partner support, has to find the best way to introduce and accommodate this policy according to its health system, dynamic interactions, institutional structures, and specific local conditions (135).
Although iCCM policy in Yemen to some level is tailored to the national health system and the response plan, the multiplicity of stakeholders and donors resulted in a lack of clarity on roles and responsibilities among these stakeholders. The situation creating an issue of who owns iCCM policy and who is accountable for its development, implementation, funding, and sustainability.
The MoPHP made some strategic decisions to select and recruit community service providers, develop training guidance, authorize their ability to prescribe drugs. Yet, community service providers are not integrated into civil service besides the low incentive and short-term contract that might affect their retention.

This study revealed that the IMCI program in Yemen struggles to be effectively integrated with co-existing vertical programs such as NMCP, Nutrition program, and maternal and new borne program. The IMCI program was not harmonized with its community counterpart, iCCM, and this gap could be widened by conflict in the management of these child health programs. Similar global studies highlighted the lack of integration as one challenge of IMCI besides the competing priorities as vertical programs such as malaria, EPI gets more funds and resources, and in some context, IMCI was considered a threat to these vertical programs (53)(86)(72).

Poor decentralization was among the weakest areas of IMCI implementation in Yemen that hinders implementing critical activities such as training. Despite that, the DHO and GHO play a role in coordination, implementation, and supervision, district autonomy was not existing with inadequate support, guidance, and response to its needs from the central

level. There is a feeling of disempowerment by management teams at the national level and the district level, and this has harmed not only the coordination of activities but also building a solid improvement plan. Evidence supported the importance of a district management team as a key component that affects the improving quality of care and scaling up of health intervention, especially the IMCI(4)(86).

The effectiveness of interventions during the humanitarian crisis is contingent on understanding priority needs, knowledge of the context, and implementation of appropriate interventions at the correct time(136).
Prioritisation of the health service, such as MSP or EPHS, have been promoted during the emergency as an effective way to scale-up service providing and enhancing the quality of care(137). Prioritisation of IMCI within MSP in Yemen might bring advantages in coordination nationwide service delivery, defining the services provided at different levels and focusing on priority health problems. Although such prioritisation focuses on maintaining essential services during the crisis, there is no consideration of health service quality nor sustainability. There is a lack of ownership as the health cluster is coordinated by the WHO and responsible for prioritisation and determination of interventions. Research and assessment are required to determine whether these interventions were prioritized properly according to the context and what are the requirements of effective implementation. An improvement in quantity and quality of services provided and health indicators were experienced in Afghanistan due to the Basic Package of Health Services; U5MR decreased to 55 per 1000 live births (138)(139). However, BPHS does not always reflect the actual need and "can be successful only if the health system requirements for their implementation are met, a rare condition in crisis contexts, where capacity constraints and inadequate funding prevail"(140)(137).

Donors fund IMCI and iCCM as the Yemeni government is unwilling to allocate budget for health during the war in addition to the economic collapse. The availability of funding has influenced decision-making in scaling up of IMCI and iCCM. Downsizing of donor's fund might affect the delivery of health services including IMCI and iCCM as they are reliant on external funds. Despite the beneficial role of donor funding, the dependence on donor and NGOs funding has transaction costs in terms of staggered implementation and distorted scale-up and needs significant coordination. Obligations to prove funding accountability and immediate outcomes impel to donors fostering a state of fragmentation(126).
The unwillingness of donors to channel the funds through the government and provided directly to NGOs could be explained in terms of high corruption in Yemen. In South Sudan, bypassing the government and give the fund to NGOs induced developmental actors to focus on emergency interventions instead of developmental(141).
The allocation of funds is the responsibility of HPF. Still, there is no donor investment in building strong government capacity to lead IMCI service delivery, and this affects the accountability and leadership role of the government.

The study revealed a high staff turnover, mainly because of the lack of salaries, poor working environment, unavailability of a retention plan, and poor human resource management. The vast difference between the incentive of CHVs and CHWs might affect the willingness of CHVs to continue providing the services, as the reputation in the community and the small per-diem quarterly, are the only motivation they received. Evidence shows that extrinsic and intrinsic motivation factors, including self-development, social responsibility, proper salary and incentives, and healthy work environment affect HWs performance and retention (142)(143).
Supervision varies in terms of frequency and quality among NGOs and MoPHP. The NGOs conduct monthly supervision to health facilities and CHWs while MoPHP carries out irregular supervision visits due to lack of resource and budgetary allocation for supervision. Despite that, some NGOs depend on MoPHP to carry out supervision on interventions they supported. In Benin, a randomized trial revealed that better care was linked to increased supervisory frequency(144).

This study revealed that despite the reported 93% of district coverage of IMCI, Yemen has only 24- 49% of health facilities having a minimum of 60% of HWs trained in IMCI. This indicates that there are still a lot of efforts needed for a 100% scale-up of IMCI. The decisions of training suspension taken by policymakers considering IMCI training as a waste of money not only hampers the scaling-up but also impairs HWs achieving competence and improving performance. Respondents report that HWs adherence to IMCI guidelines improves after training. In Afghanistan, IMCI training improved counseling, assessment, and rational use of antibiotics. Therefore, strengthening the capacity of HWs through initial and refresher training was recommended to improve the performance and enhance the quality of care(145)(55). Evidence suggested that when the clinical training on IMCI is reduced, the performance of health providers negatively compromised (146).

This study found conflict regarding adherence to the guidelines. The previous study in Yemen showed poor adherence with ineffective counseling while the interviews revealed an accepted adherence, particularly after training. This is related to the limitations of the interviews conducted. Supervision and monitoring are irregular, so it will be hard to determine the level of adherence. More studies are required to investigate the adherence. However, in South Sudan, low adherence was associated with factors such as the availability of IMCI drugs, guideline complexity, and educational qualifications(127). These factors are like factors revealed in this study.

The existence of different types of community service providers in Yemen might be appropriate, as there is variation in the distribution of childhood diseases in different areas. However, the lack of cooperation and coordination between management teams of these providers has affected the services delivery leading to the execution of essential services. For instance, CHWs are not supported with antimalaria drugs because of poor cooperation between NMCP and Community Health Workers Unit. This creates greater obstacles to progress into integration as the NMCP has its distinct strategy and funding and provides community-based service through CHVs. Hence, it has no incentive to take part in supporting other community service providers. A situation is similar to Burkina Faso(147).

This study identifies the supply chain as a significant bottleneck in the implementation of both IMCI and iCCM where periods of stock out were extensively common in health facilities and CHWs indicating lack of an effective national supply chain. The conflict and insecurity contributed to the obstruction of imports and the movement of medical supply within the country. Unavailability of these essential medications that indicated by IMCI and iCCM guidelines adversely affects the performance of health providers and patient attendance. In Malawi, insufficient stock in health facilities induced sick people to travel a far distance, seek treatment in more expensive private providers, visit traditional providers, or stay without treatment(83). The stock-outs were common in South Sudan and other countries and were associated with poor capacity and morale of CHWs and inadequate community attitude toward CHWs services and iCCM (83).
The service providing in Yemen is heavily contingent on NGOs with minimum irregular input from the MOPHP. Many health facilities are not or partially functioning due to attack, shortage of staff and lack of supply. Furthermore, most health facilities suffer from lack of running water and consistent electricity, which affect the cold chain and capacity of service delivery. The non-functional and poorly equipped health facilities affected the quality of care and linked to poor confidence of the population in accessing them (148)(149).

Data on child morbidity, mortality, and health services are critical during conflict for designing, monitoring, and evaluation of humanitarian interventions and to ensure a timely response. This study shows a critical gap in the estimation of U5MR. UN resources such as UNICEF and World Bank show no change in U5MR in the last years while other studies show a significant increase in U5MR. Although it is difficult to obtain accurate and credible information during the conflict, the increase in U5MR is inevitable as many conditions have

played a key role in driving the increase in child mortality and morbidity including malnutrition, infectious diseases, measles, and low vaccination coverage.

The guidelines and standard indicators for monitoring of IMCI that were developed by WHO do not contain details of monitoring and effective data utilization(113), so it is a responsibility of the country to determine how to collect and utilize monitoring data. This study highlights a significant gap in monitoring the quality of care because of the lack of regular follow, standardisation, and consolidation of data. Multiple NGOs and UN agencies have parallel health information systems with different indicators and various data collection tools. The compilation and analysis of data in this situation become a challenge and create difficulties in translating data into a comprehensible framework to determine humanitarian priorities. Catastrophic, sometimes unintended, consequences were linked to poor quality of data and poor analysis in an emergency context, resulting in resource wasting as funding and attention were directed toward a health issue that it is not a priority (150)(151). For example, for a long time, because of poor quality data, it was assumed that conflict speed up HIV transmission (152). Poor quality data also resulted in a suspension of food aid in South Sudan(153) and a delay of response to Ebola outbreak in West Africa(154). The situation in Yemen is even worse as the data is not used either by MoPHP as reflected by a national key informant saying ’’ we are reporting the same problems, but no one cares about the data, if they, MoPHP and NGOs, use the data there would be an improvement”. NGOs use data mostly for fundraising, which might reflect organisations competing for funding as multiple NGOs and UN agencies exist in the country. Such competitive behaviour can prolong inadequate aid projects (155).

Chapter Five

Conclusion and recommendation:

This study highlights a range of factors affecting the implementation of IMCI and iCCM in Yemen, revealing that the IMCI's success bound to the strength of key functions of the health system, especially during the crisis. It shows that the investment in establishing core services such as MSP and deployment of community-based services during the crisis has facilitated the availability of basic services, including IMCI, at a different level. However, implementing IMCI services have been hampered by insecurity, weak governance and leadership, poor coordination, inadequate decentralisation, and complete reliance on donor funds which all have resulted in a fragmented and distributed health system. Efforts regarding child health in Yemen focus on response to the crisis with no attention given to management indicators, such as drug stock management, quality of data, human resource planning. However, achieving the desired child health outcomes demands improvement in planning and health system management. Hence a concerted action is required to develop first a collaborative platform among all stakeholders to improve strategic planning and decision making for sustainable child health gains combined with district management strengthening and engagement in planning and execution of activities.

The following are some recommendations to improve the implementation despite the difficult situation in the country; the change needs time, efforts and support from external actors:

1. Position of IMCI and iCCM programs among coexisting programs needs to be explicitly defined. This will decrease the uncertainty and conflict that various stakeholders and donors encounter. There should be a single leadership structure that all stakeholders consolidate around to coordinate and harmonise IMCI and iCCM service implementation and enhance accountability. Research and innovation are required to achieve a successful integration of different programmes and reduce fragmentation.
2. Exploring internal revenue for financing through open discussion and consultations regarding financing strategies to sustain IMCI and iCCM programmes combined with active participation of political leadership are required to enhance long-term sustainability.
3. Some important steps are necessary for effective implementation, including continuous capacity building with reviewing the quality of training activities through post-training follow up, monitoring, supportive supervision, and distance technology. Shortages of human resource necessitate the government to recruit and pay salary for health providers with standardization of incentives paid by NGOs to the skills-mix providers.
4. It is important to ensure continuous availability of medications and products needed across all levels of the supply chain, including health facilities and community health providers. Investing in infrastructure repair should also be considered.

5. 5. Strengthen MoPHP information infrastructure, create a central database and feedback mechanisms from central to local levels combined with a building capacity in information management and epidemiological are all needed for effectiveness and efficiency not only for the IMCI and iCCM implementation but also for humanitarian response, particularly in such crisis

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Annexes

Annex1: Decentralized system (110)

Responsibility No.	**Financial Resources**	**Human Resources**	**Service Organization Function**	**Access and governance Rules to Governorate**
1	District and governorate health directors have authority over financial resources	Governorate and district directors can hire, and transfer staff based on needs and to improve services	MoPHP is responsible for planning and regulation and operational management of curative health services	Local governments are responsible for identifying the exempted population that has access to a minimum essential package
2	The introduction of user fee/drug fee has generated some financial income to the district level to support the operational cost and drug cost of health facilities at the local level	The governor and some officials at the central level have the power to recruit and deploy staff	Devolution to governorate level Roles: Monitoring and regulation oversight of cost-sharing schemes - contracts and licenses Monitoring of referral system within the governorate	Different community representatives, local authorities, district health management team (DHMT) are involved in setting objectives, targets, planning, discussion, supervision, and accountability
3			Hospital autonomy to ensure efficient management and quality services of hospitals	Local council and governorate health office are responsible for ensuring accountability and transparency

Annexe 2: Interview guide

Topic	Issue to discuss
Governance and leadership	• To what extent is the MOH involved in the coordination of stakeholders who implement IMCI/ICCM? • To what extent are the ICCM policy and guideline adopted? • In your opinion, what are the main challenges/ enablers of the policy/coordination/partnership regarding IMCI/ICCM?
Financing	• In the current situation, how is IMCI/ ICCM financed? • In your opinion, what are the challenges/ enablers to the funding of IMCI/ ICCM?
Service delivery	• To what extent are service provider adhering to IMCI/ICCM guidelines? • In your opinion, what are the main challenges/enablers in IMCI/ICCM service delivery?
Workforce	• In the current, the situation, does training on IMCI/ICCM still take place? • How and how often IMCI/ICCM service providers are supervised? • In the current situation, who is involved in the recruitment process for staff providing IMCI/ICCM services? • Do different cadres providing IMCI/ICCM services have job descriptions for their duties and responsibilities? • In your opinion, what are the main challenges/enablers in the workforce of IMCI/ICCM?
HIS	• Is there any parallel health information system for NGOs/donors rather than that of MOH? To what extent has the data collected by the partners been entered to the health information system of MOH? • How is the data used? To what extent is the data collected used to ensure appropriate action is taking place? • What are the challenges/enablers on monitoring and HIS regarding IMCI/ICCM?
Supply chain/ drug supply	• What are the challenges/enablers in the drug supply of IMCI/ICCM?
General improvement	• In your opinion, what can be done to improve the implementation of IMCI/ICCM in Yemen?

Annexe 3: Consent Form

Title of research: **Factors influencing implementation of IMCI in Yemen, a highly fragile country**.

Consent Form

Hello, My name is Yasameen Al-Qadasi. I am doing my Master degree in Public Health at the KIT institute, Amsterdam, and this study is my thesis. I would like to better understand the factors affecting the implementation of IMCI provided in the country. I hope that this information will help to improve the IMCI services provision.
If you agree, I would like to interview you about the challenges and enablers of IMCI implementation related to specific functions of the health system such as governance, financing, health information, supply chain and workforce.
The interview will take place through social media applications such as WhatsApp, Zoom, Skype or Facebook messenger, depending on what you prefer, and nobody can hear us, and it will last about an hour.
To make sure that I do not forget or change what you are saying, I will record the interview for which I asked your permission. Everything that will be said, written down will be kept totally confidential. Your name will not be recorded or written down. Notes will be kept in a locked place. Only I will have access to the notes.
In publications, the findings will be attributed to the services in general and not to your particular area so that nobody can recognise the setting. Tape recording and notes will be destroyed six months after finishing the academic study.
You are free to refuse to answer any question for any reason. Refusing to take part or withdraw during the interview will not affect reputation, or associated with consequences like psychological and/or physical risk.
This study will not help you directly, but the results will help to improve IMCI implementation by giving recommendation to decision-makers and partner implementers. The information extracted can be quoted in a master's thesis, journals and conferences

Do you have any questions that you would like to ask?
Are there any things you would like me to explain again or say more about?
Do you agree to participate in the interview?

Signature of the research participant

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Signature of participant Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study

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Signature of researcher Date

Annexe 4: List of Priority Interventions for Yemen MSP

1. General Services and Trauma Care

- Basic Life Support at all facilities
- Trauma care –from minor complaints to major trauma cases—at selected facilities:
- Complete care, including Radiology and Surgery, at Inter-district and Governorate Hospitals.
- Stabilization, first aid and transfer of complex cases at lower-level facilities
- Limited inpatient care, basic laboratory, delivery care and minor surgery should be available at all district hospitals.
- Services defining the level of Health Centre include OPD –children, adults, obstetric, preventive and nutrition— and laboratory. Selected facilities may offer short inpatient care and delivery room.
- e. All facilities should enforce patient safety interventions as well as ensure water supply and safe waste management

2. Child Care at all levels

- Immunization
- Integrated Management of Childhood Illnesses

3. Nutrition

- Identification and management of Severe Acute Malnutrition (SAM) without medical complications at all levels
- Identification and Management of Moderate Acute Malnutrition at all levels.
- Counselling on Infant and Young Children Feeding Practices at all levels.
- Management of SAM with medical complications at facilities offering inpatient care.
- Distribution of micronutrients at all levels

4. Communicable diseases

- Priority interventions include
- Tuberculosis: continuity of treatment for patients already in treatment. Resume diagnostic in selected facilities when feasible
- Malaria management in the relevant areas
- Management of common infectious diseases according to drug and guidelines availability according to the level (drug supply

5. Reproductive, Maternal and Newborn Health

- Family Planning, at least short-acting methods at all facilities
- Management of cases of Sexual and Gender-based Violence, at the level of District Hospital (DH).
- Syndromic management of Sexually Transmitted Infections at HC and DH
- Antenatal care, focusing on the most useful components: distribution of micronutrients, and identification and management of conditions such as infections, anaemia, etc at all levels.
- Delivery care at selected facilities: all District Hospitals and selected PHC Centres.
- BEmONC/CEmONC at referral facilities: all Governorate and Inter-District Hospitals (see below).
- Essential Newborn Care: prevention of infection through cord care; thermal protection with Kangaroo Mother Care; Resuscitation; Early and Exclusive Breastfeeding; Eye Prophylaxis; Immunization. Should be available at all levels.
- Care of preterm and/or low-birth-weight newborn, and management of newborn sepsis limited to inter-district hospitals and selected district ones.

6. <u>Non-Communicable Diseases</u>

- The top priority is to continue delivering drugs and monitoring to patients already diagnosed and in treatment.
- Using the PEN and Total Risk Assessment approaches diagnostic and management of HTN and DM (and COPD later on) where possible, starting with referral hospitals.
- c. Management of chronic pain, starting with District Hospitals.

<u>7. Mental Health</u>

- Top priority: continuity of care to patients already in treatment
- b. Diagnostic and management of Anxiety and Depression where possible, starting with referral hospitals

Source: Yemen Minimum Service Package (80)