Internship Training
At
Jhpiego, New Delhi

Landscape of POC diagnostics devices being use in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for comprehensive Primary Healthcare.

by

Dr Pankaj Joshi
PG/21/141

Under the guidance of

Dr Tukaram Khandade

PGDM (Hospital &Health Management) 2021-2023

International Institute of Health Management Research, New Delhi

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Enroll No. PG/21/141

Under the guidance of

Dr Anandhi Ramachdran
PGDM (Hospital &Health Management) 2021-2023

International Institute of Health Management Research, New Delhi

Completion of Dissertation from respective Organization

This certificate is awarded to

Dr Pankaj Joshi

In recognition of having successfully completed his/her internship in the department of

Digital Health and Innovation

And has successfully completed his/her Project on

Landscape of POC diagnostics devices being use in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for Comprehensive Primary Healthcare.

From

February 20th 2023 to May 19th 2023

At

Jhpiego

He comes across as a committed, sincere & diligent person who has a strong drive & zeal for learning.

We wish him all the best for future endeavors.

Training and Development

Dr Tukaram Khandade

Zonal Head -Human Resources

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr Pankaj Joshi** student of PGDM (Hospital & Health

Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **Jhpiego, India from February 20th 2023 to May 20th 2023.**

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of course requirements.

I wish him all success in his future endeavors.

Dr Sumesh Kumar
Dean , Academics and Student Affairs
IIHMR, New Delhi

Dr. Anandhi Ramachandran
Professor , IIHMR, New Delhi

Certificate of Approval

The following dissertation titled **"Landscape of POC Diagnostics Device being use in various countries in Scope of South Asian Countries for Comprehensive Primary Healthcare", at Jhpiego, NEW DELHI"** is hereby approved as a certified study in management carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of the dissertation.

Name	Signature
SHASHI BHUSHAN GOGIA	
Dr. Sumeet Kumar	
Dr. Pankaj Talreja	

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Pankaj Joshi,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He/ She is submitting this dissertation titled " **Landscape of POC diagnostics devices being use in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for Comprehensive Primary Healthcare** at "Jhpiego" in partial fulfillment of the requirements for the award of the **PGDM (Hospital & Health Management).**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Dr Anandhi Ramachandran,
Professor,

IIHMR, Delhi

Dr Tukaram Khandade
Lead Innovation,

Jhpiego, Delhi

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH,

NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **Landscape of POC diagnostics devices being use in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for comprehensive Primary Healthcare** and submitted **Dr Pankaj Joshi** Enrollment No.**PG/21/141** under the supervision of **Dr. Anandhi Ramachandran** for award of PGDM (Hospital & Health Management) of the Institute carried out during the period from February 20th 2023 to May 20th 2023 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

Dr Pankaj Joshi

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Name of the Student: Pankaj Joshi

Name of the Organization in Which Dissertation Has Been Completed: Jhpiego, New Delhi, India

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Objectives achieved: Yes, he has completed the literature search, Analysis, and report writing

Deliverables:
He has submitted the final report on the landscape study

Strengths:
He is good at analysis and has the technical knowledge to understand the digital health stream

Suggestions for Improvement:
He needs to continuously read the digital health literature to acquaint himself with the latest happening in the digital health stream.

Suggestions for Institute (course curriculum, industry interaction, placement, alumni):
Besides internships, the institute may initiate a tie-up with industry players, through which the students after completion of elective modules (logistic management, NGO management, advocacy, etc) may be posted for one day at the industry to observe how it is done practically.

Dr Tukaram Khandade
Signature of the Officer-in-Charge/ Organization Mentor (Dissertation)

Date: 28.6.2023

Place: Delhi

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Dr Pankaj Joshi
PG/21/141

Table of Content

Abstract

This report provides an overview of a dissertation titled "Landscape of POC diagnostics devices being used in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for Comprehensive Primary Healthcare." The study was conducted at Jhpiego, New Delhi, as a part of the PGDM (Hospital & Health Management) program offered by the International Institute of Health Management Research.

The objective of the study was to explore the current landscape of point-of-care (POC) diagnostic devices use for primary healthcare. The research was carried out under the supervision of Dr. Tukaram Khandade, Dr . Rohini Kumar Durbha with Dr. Pankaj Joshi as the Post graduate student responsible for the study.

The report highlights the methodology employed, including data collection and analysis techniques. It also presents the key findings and insights derived from the study, shedding light on the types of POC diagnostic devices being utilized and effectiveness in delivering comprehensive primary healthcare.

Furthermore, the report discusses the implications of the findings and their potential impact on healthcare systems in the South Asian region. It emphasizes the importance of POC diagnostic devices in improving healthcare delivery, particularly in resource-constrained settings.

Overall, this report serves as a valuable resource for healthcare professionals, policymakers, and researchers interested in understanding the landscape of POC diagnostic devices and their role in comprehensive primary healthcare. It provides a comprehensive analysis of the current situation and offers insights for future research and policy development in this field.

Keywords: POC diagnostics devices, South Asian countries, comprehensive primary healthcare.

List of Abbreviations

- IoM- Institute of Medicine
- MBBS- Bachelor of Medicine and Bachelor of Surgery
- TB- Tuberculosis
- HIV- Human Immuno deficiency Virus
- BHP- Basic healthcare services
- NHP- National Health Policy
- NPR- Nepalese Rupees
- USD- US Dollar
- GoN- Government of Nepal
- HF- Health Facility
- PHCC- Primary Healthcare Center
- EDP- External development partners
- SSF- Social Security Fund
- EPF- Employee Provident Fund
- NHIP-National Helath Insurance Program
- UHC- universal health coverage
- HIA-Health Insurance Act
- HIB- Health Insurance Board
- HIR- Health Insurance Regulation
- MoHP- Ministry of Health and Population
- WHO- World Health Organization
- NGO- Non- Government Organization
- ANSF- Afghan National Security Forces
- ANA- Afghan National Army
- NATO- North Atlantic Treaty Organization
- UN- United Nations
- GDP- Gross Domestic Product
- NSPA- National Social Protection Agency
- DOTS- Direct Observed Therapy

Nepal Healthcare System

Healthcare Background

In 1956, the First Five Year (Developmental) Plan included the establishment of the first General Health Plan in Nepal. Family Planning, Leprosy and Tuberculosis, and Smallpox Eradication programmes were initiated in 1958, 1966, and 1968, respectively. The Malaria Eradication Organization was founded in 1955. The Family Planning and Maternal Child Health Board replaced the Family Planning Programme in 1968. In order to provide every Nepalese person with access to basic healthcare services, significant progress has been made in the health sector since the General Health Plan was introduced in 1956. As a result of this, the majority of people now reside within one or two hours' walking distance of a clinic, hospital, health centre, primary health care centre, health post, or sub-health post. (1)

Up until 1972, there were no medical colleges in Nepal, thus those who wanted to become doctors were required to further their education in India and other countries. Under the leadership of Dr. Moin Shah, the Tribhuvan University's Institute of Medicine (IoM) ushered in a new era in medical education by enabling students to complete their training for careers in healthcare from the comfort of their own homes. Dr. Shah started Auxiliary Nurse Midwives and Community Medical Assistants courses as soon as he was appointed dean. He accepted 22 students as the IoM's inaugural batch of MBBS students six years later, in 1978. Then, all types of health workers and professionals were produced. (2)

In 1991, the first National Health Policy approved and started with the aim to establish one modern health care health facility (Primary health centers and sub-health posts) in all 4000 municipalities or village development committees. Few specialized hospitals were established to treat Non-communicable diseases.(3)

The first hospital, BP Memorial Cancer Hospital, was founded in 1996, marking the beginning of the system for establishing hospitals as autonomous bodies by legislation. Devolution-related activities began in 2004, however they were initially only limited to a few trial districts.Municipalities received a full devolution of basic health services in 2017.In 1934, the Nepal Government Hospital and Dispensary Office became the Department of Health Services.Mother's groups and female community health volunteers are two examples of how the community is involved in Nepal's health system. In addition, people are starting to donate money and land for the construction of medical institutions. (1)

The Nepali government has made great strides in the recent few decades in lowering the rates of infant, maternal, and under-five mortality. With the eradication of polio, maternal and neonatal tetanus, and leprosy during this time, Nepal was able to stop and reverse the trends of TB, HIV, and malaria. Equitable access to healthcare remains a significant concern despite these advancements. The health sector is facing a growing challenge as a result of the rise of non-communicable diseases, including mental health issues, health issues brought on by natural disasters, and an increase in the number of fatalities and injuries from traffic accidents. (4)

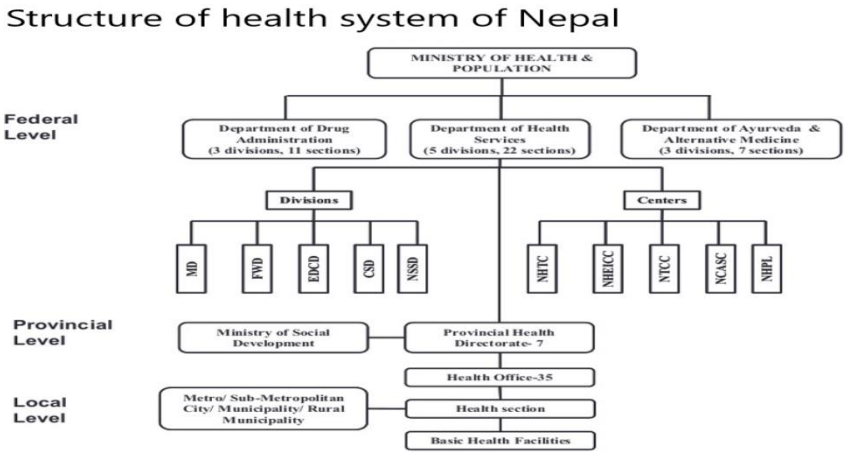
Nepal seeks to accelerate the implementation of UHC. According to Nepal's National Health Policy (2014), basic healthcare services (BHCS) would be free of charge, while non-BHCS will be covered by social health insurance. Nepal’s NHP,2014 determines four strategic directions (5)

- Multi- sectoral approaches
- Improved service quality,
- Equitable access, and
- Health system reform

Structure of Health System

Nepal has implemented two distinct health delivery systems: a privatized system with paid services and a nationwide financed one. There are now three levels of government (federal, provincial, and local) under the federal system of 2017.(6) Currently, a wider network of 7221 public HFs (125 hospitals, 205 PHCCs, 395 Ayurvedic hospitals, 3870 HPs, and 2626 community health centers) that are under the control of any of these three tiers of government provide public health services. (7)

Additionally, since the late 1990s, private healthcare services have been offered by private healthcare institutions (hospitals, nursing homes, clinics, and private medical shops).



Picture source: https://publichealthglobe.com/structure-of-health-system-in-federal-context-of-nepalhealth-system-in-nepal/

Afghanistan Healthcare System

Background

Nearly 30 million people live in Afghanistan, a non-coastal nation that is halfway between the Middle East, Central Asia, and South Asia. Afghanistan is made up of 34 provinces. Conflicts have had a detrimental effect on Afghanistan's public and private sector services over the years, especially healthcare services. Healthcare professionals were not ignored

because they have been at the epicenter of the crisis from the beginning because of the failing state of the dying nation.(9)
Additionally, fewer healthcare professionals are employed than the World Health Organization (WHO) recommends, which was 0.278 physicians per 1000 inhabitants in 2016 . Thus, this significantly increased the workload for healthcare professionals.(10)

Afghanistan shares borders with Pakistan, Iran, China, Tajikistan, Turkmenistan, and the Central Asian Republics of Uzbekistan and Uzbekistan. Western interest and backing for the Soviet invasion and war, which lasted from 1979 to 1989, waned once it was over. A large portion of Afghanistan's infrastructure, including the meager health care facilities that were present, was destroyed during internal battles for power. Under the Taliban era, the health care system was likewise plagued by inept government.(11)
Since the US invasion that toppled the Taliban in 2001, the majority of healthcare is provided by NGOs. Later on some health care, mostly tertiary care, is provided by the Afghan National Security Forces (ANSF), which are made up of the Afghan National Army (ANA) and the Afghan National Police (ANP). However, the ANSF must continue to receive foreign support in order to be effective. The ANSF's regional hospitals are located in Kandahar, Gardez, Mazar-e Sharif, and Herat, although Kabul is where the majority of its tertiary services are offered. Currently, 82% of the populace resides in districts where primary healthcare services are offered by NGOs through grants or contracts with the Afghan Ministry of Public Health. (12)

Present Status (Healthcare System Collapse)

Due to the abrupt collapse of the Afghan government to the Taliban during the COVID-19 pandemic, Afghanistan's foreign aid-dependent health sector worsened along with the withdrawal of American and North Atlantic Treaty Organization (NATO) soldiers. Even though there have recently been fewer overall war-related deaths, many individuals still pass away because they cannot receive even the most basic medical care. The breakdown of Afghanistan's healthcare systems is a result of a combination of political unrest, severe natural disasters, and a lack of international assistance.(13)
Afghanistan only has 9.4 healthcare staff per every 10,000 patients, as opposed to the 22.8 that the World Health Organization advises.(14)
Afghanistan, which depends on foreign help for 80% of its budget, experienced significant aid suspension once the Taliban came into power. More than 20 million Afghans now depend on humanitarian help to survive after international governments and institutions stopped or redirected the flow of financial aid. Furthermore, given that many organizations have already left Afghanistan, foreign donors will be less likely to contribute the humanitarian relief that the United Nations (UN) is demanding(15). Millions of people's well-being will be at risk as a result of decades of efforts to overhaul the healthcare system in Afghanistan being put to an end by the country's continuing economic catastrophe. As a result of World Bank programs, 30 million Afghans received medical care, but after the Taliban came to power, international donors stopped funding the health institutions that depended on it.(16)

Maldives Healthcare System

The Maldives, an upper-middle income nation in South Asia, has made significant advancements in public health and development during the past few decades. Male, the nation's capital, is home to one-third of the people, with the remaining two thirds spread throughout 186 inhabited islands.(19)
The Maldives' government spent 9% of its GDP on health in 2018, far more than the norm for the region (which is 3.5% of GDP) (20). The national social health insurance program known as Husnuvaa Asandha ("Asandha") insures all Maldivian people and is funded by the national budget (21).
It is administered by the National Social Protection Agency (NSPA), which is part of the Ministry of Health, and was established in 2011 by the National Social Health Insurance Act. (22)

Service Delievery

In the Maldives, the delivery of healthcare services is done via a four-tier referral system. Each atoll and island health facility has a public health unit that offers fundamental services like immunization, directly observed treatment, short-course (DOTS) for TB, health education and counseling, and reproductive and child health care. Patients who need more advanced or specialized care are referred by the island-level healthcare facilities to higher-level healthcare facilities in the atolls, regions, and central levels. The Maldives' health system faces a number of difficulties because of its location and frequent extreme weather events. Despite these obstacles, Maldives managed to make significant improvements in its citizens' health through a primary healthcare strategy, high-level commitment to health, and systematic reforms to the health sector.(23)

Pakistan Healthcare Delivery System

Pakistan, which gained independence on August 14, 1947, is a developing nation. It does not have a health policy at that time. Therefore, at that time, it inherited the British side's three-tiered health care system:
1. Primary Healthcare system
2. Secondary Healthcare system
3. Tertiary Healthcare system(28)

1. Primary Healthcare system: The primary healthcare system is the first tier of healthcare, when people frequently see with curative and preventive healthcare services for the first time.

(i) Basic Health Units & Rural Health Centers: Up to 25,000 people are served by Basic Health Units (BHUs) at the Union Council level. It offers patients preventive, curative, and referral services. Up to 100,000 patients can receive preventive, therapeutic, diagnostic, and referral treatments from rural health centres (RHCs). (ii) Rural Health Centers (RHCs): Along with this, it provides assistance to BHUs, LHWs, and MCH Centres so they can advance their job.(29)

2. Secondary Healthcare system: The second level of the healthcare system, known as secondary healthcare, is primarily focused on giving patients access to technical, therapeutic, and diagnostic services. At district and tehsil levels, it is regarded as the first referral level.

3. Tertiary Healthcare system: Hospitals for tertiary healthcare provide inpatient care that is more specialised And inpatients who were referred from primary or secondary healthcare facilities receive all of these treatments.(30)

Hospitals in the public and private sectors provide the majority of the country's healthcare.(31)

A review found that just 30% of Pakistan's population uses public hospitals, although over 70% of the population seeks care in private hospitals.(28)

Recent studies have shown that Pakistan is making efforts to improve its citizens' health through the introduction and rigorous implementation of vertical immunization programmes, by raising awareness of maternal and child health issues, and by investing in programmes for female health workers and visitors.(32)

By creating new health policies, taking part in the Millennium Development Goals (MDG) programme, encouraging public-private partnerships, investing in the improvement of human resources and skills, and establishing Basic Health Units (BHUs) and Rural Health Centres, Pakistan is taking an interest in and attempting to provide better health to its population.(33)

Even if the signs show that these programmes are successful and helpful, their overall reach is constrained and ineffective. The flaws in the system can be attributed to inadequate governance, unstable leadership, corruption, incorrect resource utilisation, ineffective HMIS, and subpar monitoring rules.(34)

The goal of universal health coverage (UHC), a concept, is to guarantee that everyone, especially those in need, has access to basic medical care when and when they need it, free of charge. UHC is reflected in Sustainable Development Goal 3.8, which was accepted by the UN in 2015.(35)

Due to poor care quality and a lack of access to basic necessities like commodities and services, Pakistan's health system has imprinted structural and non-structural barriers that prevent and deny access to health services for the poor and marginalised groups, including women who continue to be disproportionately affected.(36)

There are many issues with Pakistan's primary healthcare system. Decentralisation offers the chance to introduce fundamental reforms in the Primary Healthcare system to make it more effective and efficient for the general public. The Primary Healthcare Sector's main goal is to transfer the efficient system from the federal to the local level.(37)

“Primary Healthcare system includes building blocks such as leadership, service delivery, technology, health workforce, healthcare finance and research”. When obtaining quality services and pursuing goals at the same time, monitoring and assessment are crucial.(38)

Bangladesh Healthcare System

Bangladesh is a South Asian nation with a large and impoverished population. Its population, which was 156.6 million in 2013, is projected to reach 218 million by 2030.(39)
Urban populations are expanding, yet they are frequently underserved in terms of fundamental needs like housing, security, and access to necessary services like health, sanitation, and drinking water. Bangladesh is still predominantly a rural nation, with more than 70% of the population still residing there, despite the country's rising urbanisation.
The needs of rural areas were the primary emphasis of Bangladesh's health system in the years immediately following independence in 1971. The initial five-year plan (1973–1978) emphasised the significance of creating a nationwide network of health services, including hospitals in each district, often augmented by Maternal and Child Welfare Centres (MCWC) and Upazila Health Complexes (UHC) in each Upazila. The family planning programme was organizedly reintroduced by the Government of Bangladesh (GOB) with the creation of the First Five Year Plan (1973–78), and a separate Directorate of Family Planning was established inside the Ministry of Health and Family Welfare.
A global alliance of bilateral development organisations began offering the GOB financial and technical support for the implementation of a series of population and family planning initiatives in 1975, each lasting five to six years and coordinated with the World Bank.(40)
The majority of the population cannot have timely access to healthcare services without a reliable healthcare financing system. When consumers require health services, the system itself evaluates whether they can pay for them without experiencing any financial difficulty. As a result, the World Health Organisation (WHO) committed to and advised that countries build a finance system to ensure that all people have access to services and do not experience financial hardship paying for them. This was done in recognition of the necessity of equitable health systems financing (HSF).(41)
The sixty-fourth World Health Assembly advised member states to incorporate a means for prepayment of financial contributions for healthcare and services and to avoid making significant direct payments at the point of delivery. In order to prevent uncontrollable healthcare costs and the destitution of people and households, it also asked members to come up with a system for sharing risks among people. With an area of 56,977 miles and a population of 161.03 million.(42)
Bangladesh is undergoing a transformation in its population and epidemiology.(43)
Despite being the 94th largest in area of land, the nation has the eighth highest population in the world. With a dependence ratio of 52.5%, 28.27% of the population is under 14 years old and 6.04% is over 65. The life expectancy at birth is 73.2 years, and the population growth rate is estimated at 1.05% for 2016. However, there is a high prevalence of both vector-borne diseases like dengue and malaria as well as food and waterborne illnesses like bacterial and protozoal diarrhoea, hepatitis A and E, and typhoid fever. Since 1996, the economy has increased by about 6% annually.(44)
Bangladesh HSF is distinguished by rising out-of-pocket (OOP) payments while also lacking a functioning prepayment system. (44) The payments for OOP as a percentage of private health spending are greater in Bangladesh (92,9) than in India (89,2%) and Nepal (79,9%).(45)
The Bangladesh National Health Accounts . According to the Bangladesh National Health Accounts , household OOP spending—which rose from 56.9% of total health expenditure (THE) in 1997 to 63.3% in 2012—remains the largest source of HSF. With a contribution of 26.0% to THE, the government is the second-largest financier. Over time, the percentage of

private companies has stayed about the same at 1.0%. Over the years 1997 to 2012, the percentage of non-governmental organisations (NGOs) funded by their own resources varied between 1% and 2.0% of the THE. The government or NGOs that are development partners provide funding. During that time, NGOs accounted for the remaining 5% to 9% of spending. In 2010, household spending as a share of GDP climbed from 1.6% to almost 20.0%. Bangladesh's health spending was 3.4% of GDP, which is much less than the average for the South East Asia (SEA) region (3.8%), low-income nations (5.4%), lower-middle income countries (4.3%), and the entire globe (8.5%).(45)

Most of Bangladesh's HSF's regressivity can be attributed to the country's high OOP and the absence of a working system for collective prepayment. Social insurance is extremely minimal, and private health insurance is only available in a few NGO-run "pocket areas." The system urgently needs to implement health insurance programmes for the underprivileged, old, disabled, and people with disabilities. It is necessary to adopt measurable progressivity milestones for each country. This aspect of policy decisions can be guided by the study's findings.(46)

Sri Lanka Healthcare System

In close proximity to India's southernmost point is the island of Sri Lanka 21.4 million people live there. Sinhalese make up 75% of the population, followed by Sri Lankan Tamils (15%) and Sri Lankan Moors (9%). With an increasing feminization, the population of the nation is quickly ageing, with the proportion of people over 65 growing from 3.7% in 1970 to 10.8% in 2019. (47)

The allopathic method is mainly used in Sri Lanka's diverse healthcare system. Initiating the health unit as the cornerstone for community-based care in 1926 marked the beginning of the first organized systems of care provision. Traditional healing and alternative medical practises like ayurveda were still in use at the time. The current allopathic system includes both curative and preventative healthcare through a decentralized management style that runs in the public sector over the entire nation, while the private sector offers services in accordance with market demand. The health system was mostly established during a time when communicable diseases were widespread and episodic management was a crucial component. Over time, it has undergone small but steady adjustments. Further modifications to the way primary care is organized are being made in order to address the current health burden of noncommunicable illnesses. (48)

POC Diagnostics Devices

Point of Care (POC) diagnostics are used in a range of clinical disciplines to enhance patient outcomes and provider effectiveness. They are a crucial part of modern medicine.(49) Over the past 40 years or more since point-of-care testing (PoCT) became widely used, the amount of PoCT has constantly increased. Due to developments in healthcare delivery that are aimed at providing affordable care closer to the patient's home, that growth is anticipated to continue. The problem of providing more efficient treatment for infectious diseases in the underdeveloped world exists, and PoCT may play a significantly larger role in this area in the future. (50)

Point-of-care (POC) testing is the process of collecting specific clinical data and parameters while a patient is being checked. POC has many definitions, all of which explain the same concept—quick acquisition of test data so that the patient can begin receiving the proper care

as soon as possible. Because of its user-friendly qualities, POC diagnostic devices are utilized by medical professionals, patients, and their families.Rapid blood glucose analysis technology was produced in 1962, which led to the introduction of POC testing. A few years later, in 1977, rapid pregnancy tests were developed, which helped to establish the trend for individualized diagnoses. POC testing and devices were made available in clinical settings and laboratories worldwide thanks to these advances, which significantly altered the diagnostics industry. POC diagnostic tools are widely utilized nowadays and are available for a wide range of analytes; their applications include personal care, outpatient clinics, and intensive care units. (51)

Types

- Unconnected
- Connected

Unconnected

Point-of-care diagnostics are medical tests that can be carried out on-site or close to the location of the patient's care without the need for a centralized laboratory.
Point-of-care diagnostics are referred to as "non-connected" if they are not wireless connected to a centralized database or a Application.(52)

Connected

The point-of-care devices that are linked to hospital or laboratory information systems, mobile applications, and electronic medical records are called Connected POC diagnostics devices. Such devices assist in monitoring and managing data, POCT devices, and operators as well as automatically validating and transferring patient results collected from POCT devices to the electronic medical record. (53)

Classification of POC Diagnostics devices

- Handheld/ Portable: The segmentation of PoCT devices into small handheld/ Portable ones, such as quantitative and qualitative strips, Rapid Test Kits, Handheld Glucometers, etc. are the examples of Handheld PoCT devices.(50)

- Bench top: Larger or bench-top gadgets with more complicated built-in features are frequently variants of those used in traditional laboratories. similar to X-ray, blood, CT, and MRI devices, are bench top devices.(50)

- Wearable: Devices worn on the body or on clothing are referred to as wearable devices. They are made up of a transducer and a target receptor. The target analyte is recognized by a receptor, and it reacts accordingly.(54)

Review of Literature

1.Chao Wang et al. (2021), Point-of-care diagnostics for infectious diseases: This review study provide the insight and ways to improve POC diagnostics in the future for the treatment of infectious diseases and to help stop and contain pandemics like COVID-19. The POC diagnostics have a number of benefits over labor- and time-intensive traditional diagnostic techniques, including faster diagnostic speed, improved sensitivity and specificity, cheaper cost, more efficiency, and the capacity for on-site detection. In this review, several POC detection techniques for the diagnosis of infectious diseases were briefly discussed. These techniques included electrochemical biosensors, fluorescence biosensors, surface-enhanced Raman scattering (SERS)-based biosensors, colorimetric biosensors, chemiluminescence biosensors, and magnetic biosensors.

2. Christopher S Wood et al.(2019), Taking connected mobile-health diagnostics of infectious diseases to the field, The use of mobile devices, their components, and related technologies in healthcare is known as "mHealth," or mobile health. Access to care and guidance for patients has already improved. It now offers unique techniques to detect, track, and control infectious diseases as well as ways to boost the effectiveness of the healthcare system when used in conjunction with internet-connected diagnostic tools. Here, this paper looks at the potential of these technologies and talk about the difficulties in making use of their potential to improve patient access to testing, assist in their treatment, and enhance the capacity of public health authorities to track outbreaks, put response plans into place, and evaluate the effects of interventions globally.

3. Junjie Liu et al.(2018), Point-of-care testing based on smartphone: The current state-of-the-art (2017–2018), In this study, they selected liquid biopsy samples (blood, urine, sweat, saliva, and tears) as the benchmark for categorizing smartphone-based POCT devices since they contain a variety of disease-related indicators. The evolution of smartphone-based POCT devices over the previous two years (2017–2018) was thoroughly examined, and their relative benefits and downsides were evaluated. The development of POCT indicates how important and urgent the various technological and economic requirements are. The prevalence of high-quality, reasonably priced smartphone-based POCT devices, as well as the characteristics of the biosensors (paper-based sensor, flexible device, microfluidic chip, etc.) now utilized in POCT, were outlined, along with suggestions for future research.

4. Aditya Narayan Konwar et al(2020), diagnostic devices in the Indian healthcare system with an update on COVID-19 pandemic, The traditional clinical diagnostic process is time-consuming and expensive because it calls for expensive, high-end equipment, a skilled technician to operate it and interpret the results, among other factors. The adoption of POC diagnostic tools is still in its early stages, despite the fact that the medical facilities have undergone significant advancements. This review describes the limitations to the use of POC diagnostic tools currently employed in clinical settings. This article also discusses the effects of deploying POC diagnostic equipment

and the long-term goals for technological development that could eventually improve the status of healthcare system and related industries.

5. Dionysios C. Christodouleas et al.(2018), From Point-of-Care Testing to eHealth Diagnostic Devices (e Diagnostics), The initial purpose of point-of-care devices was to enable medical testing by healthcare professionals at or close to the point of care. While some point-of-care devices enable medical self-testing at home, they are unable to fully meet the expanding diagnostic requirements of the eHealth systems being developed in many nations. To enable remote patient monitoring, a number of user-friendly, network-connected diagnostic instruments for self-testing are required. This Perspective identifies point-of-care technologies that could result in the creation of new devices and underlines the crucial qualities of diagnostic devices for eHealth settings. Also, it presents the best cases of straightforward point-of-care tools that have been utilized to analyze untreated biological material.

6. Kaichen Xu et al. (2019), Toward Flexible Surface-Enhanced Raman Scattering (SERS) Sensors for Point-of-Care Diagnostics, . In-depth research is done on the most recent developments in flexible substrate-based SERS diagnostic devices. In the main part of the paper, the three most recent categories of flexible SERS substrates—actively adjustable SERS, swab-sampling strategy, and in situ SERS detection approach—are highlighted. Furthermore, offered are additional promising flexible SERS methods. Flexible SERS substrates can be included into portable Raman spectroscopes for point-of-care diagnostics, which are likely to enter the worldwide market and households as next-generation Wearable sensors in the near future due to their low cost, batch production, and ease of operation.

7. Subrata Mondal et al. (2020), Wearable Sensing Devices for Point of Care Diagnostics, This paper provides a comprehensive overview of current developments in smart wearable biosensors with a focus on applications in point-of-care diagnostics. The present analysis additionally highlights the deployment in clinical trials, validation, and a rigorous comparison of already accessible commercial devices. The problems and potential outcomes for scientists and engineers working in the developing interdisciplinary field are discussed in the work's conclusion.

8. Diana-Gabriela Macovei et al. (2022), Point-of-care electrochemical testing of biomarkers involved in inflammatory and inflammatory-associated medical conditions,

This review focuses on the most recent developments in bioanalysis of both specific and inflammatory-associated biomarkers, which are present in a variety of diseases like neoplasia, severe neurological disorders, viral infections, and routine physical activity. It also gives a state-of-the-art overview of the most recent electrochemical (bio)sensors for the detection of inflammation-related biomarkers. The potential for point-of-care testing to enhance healthcare administration is also explored.

9. Arpana Parihar et al. (2023), Internet-of-medical-things integrated point-of-care biosensing devices for infectious diseases: In this review the design and manufacture of POCT devices for the detection of microbiological pathogens, such as bacteria, viruses, fungus, and parasites, were covered . They include primarily microfluidic-based technologies, smartphone and Internet-of-things (IoT) and Internet-of-Medical-Things (IoMT) integrated systems, and current advancements in electrochemical techniques and integrated electrochemical platforms. Also, a briefing on the commercial biosensors that are available for the detection of microbial infections will be provided.

10. Benjamin Heidt et al. (2020) Point of Care Diagnostics in Resource-Limited Settings: A Review of the Present and Future of PoC in Its Most Needed Environment

This research looks at the value chain of PoC devices and the barriers that prevent them from reaching the market and exerting a benefit to the patient. It looks at the different domains of research, market, and usage, and how each of these domains can be further subdivided into subdomains. It also looks at the importance of connecting all stakeholders, such as research groups, companies, healthcare professionals, as well as governments and NGOs, to enable IP considerations and licenses to be negotiated to everyone's benefit. It also looks at the importance of a multidisciplinary team for market introduction, the need for funding and incentives for valorization, the need for appropriate device characteristics, and the need for collaboration between academia and industry. Finally, it looks at the importance of IP considerations and the role of the World Intellectual Property Organization (WIPO).

11. **Tobias Miesle et al. (2020)Frugal Innovation for Point-of-Care Diagnostics Controlling Outbreaks and Epidemics:** The research explained frugal innovation as the creation of affordable, uncomplicated, and user-friendly devices to meet the needs of settings that have limited resources. Since POC diagnostics for controlling outbreaks and epidemics must be accessible, quick, and easy to use, frugal innovation can be especially helpful in this area. The study analyzes a number of case studies of frugal innovation in the creation of POC diagnostics for limiting epidemics and outbreaks. The creation of a low-cost Ebola virus diagnosis, a portable, affordable HIV viral load monitor, and a rapid malaria diagnostic test are some examples of these case studies. According to the article, cost-effective innovation can have a number of advantages, such as better patient outcomes, more patients having access to diagnostics in settings with limited resources, and lower healthcare expenditures. Yet, there are obstacles to inexpensive innovation as well, including financing restrictions, legal barriers, and the requirement for stakeholder participation.

The article's overall conclusion is that frugal innovation could improve the design of POC diagnostics for limiting epidemics and outbreaks. To address the issues with frugal innovation, however, and to guarantee that these diagnostics are trustworthy and effective

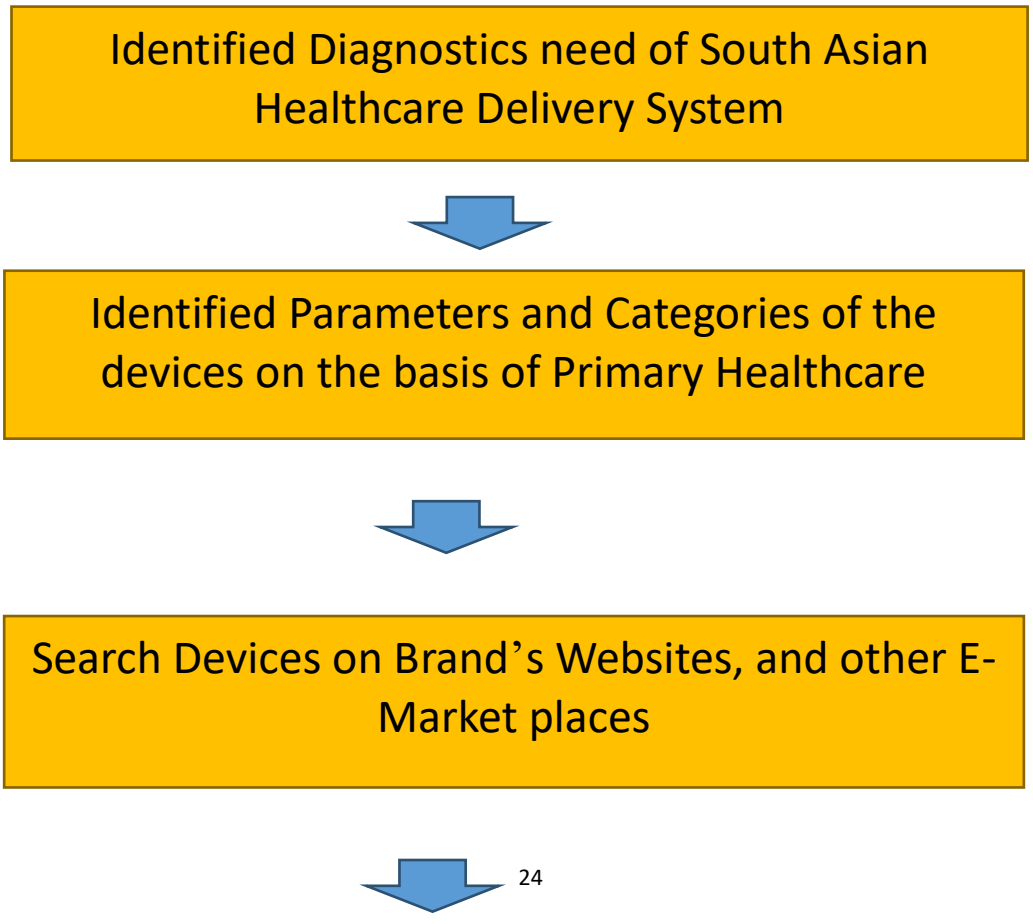
in identifying and managing outbreaks and epidemics in resource-constrained contexts, more research and development is required.

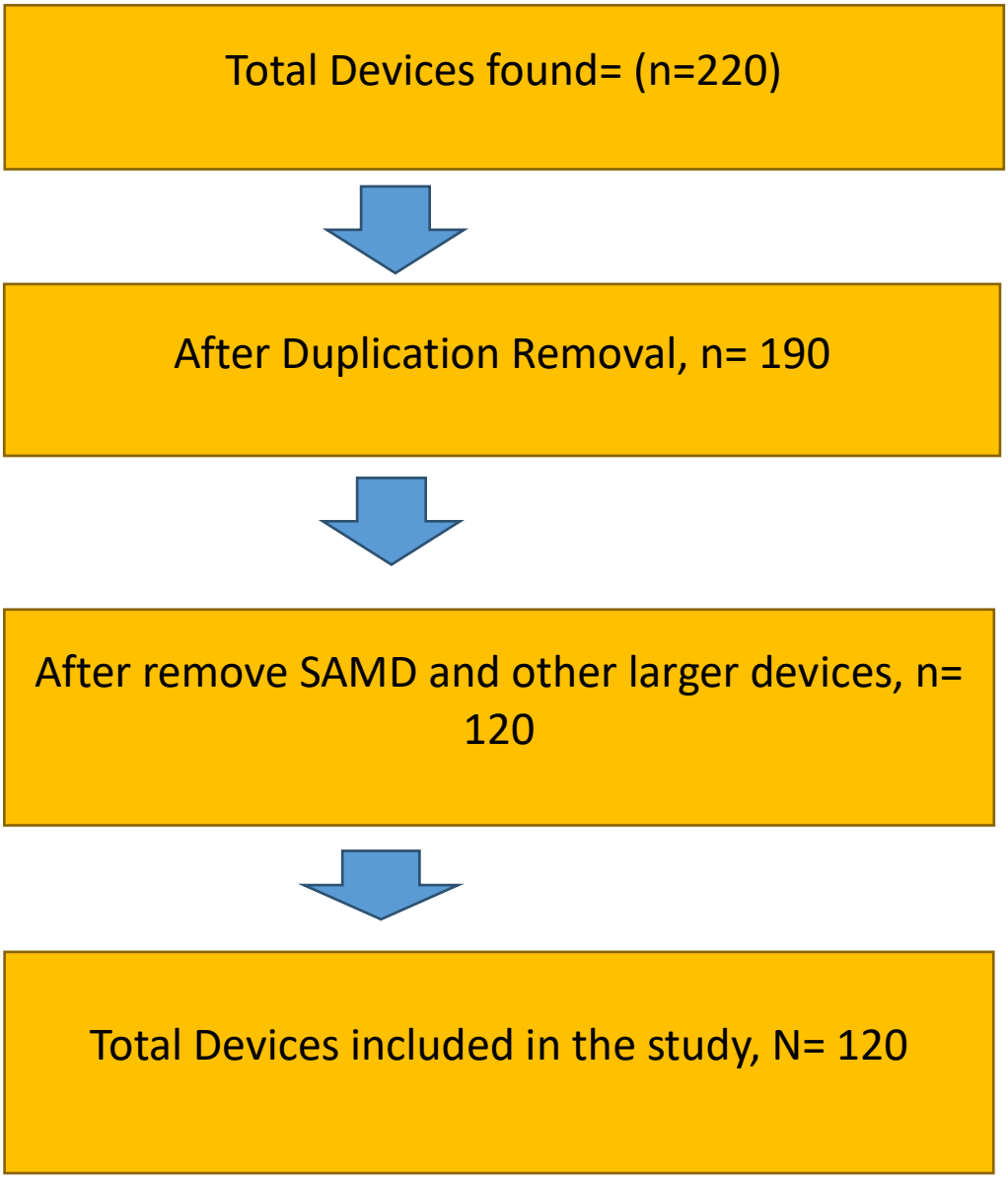
12. Rajat Vashistha et al. (2018)Futuristic biosensors for cardiac health care: an artificial intelligence approach:

The article "Futuristic biosensors for cardiac health care: an artificial intelligence approach," in conclusion, perhaps sheds light on the potential of biosensors and AI in cardiac healthcare. To create efficient technologies that can enhance the diagnosis and treatment of cardiac disease, further research in this area is required.

Study Methodology

Data for this study was gathered from reputable e-commerce sites and the device's brands websites. In the beginning, we looked for and collected n = 220 point-of-care diagnostic devices. We had 190 devices left over after eliminating duplicates. Then, because they are unsuitable for primary care, SAMDs and bigger POC equipment were omitted. In the end, 120 point-of-care diagnostic tools that are readily available and appropriate for use in South Asia for comprehensive primary healthcare were recorded.




Total Devices found= (n=220)
After Duplication Removal, n= 190
After remove SAMD and other larger devices, n= 120
Total Devices included in the study, N= 120

Rational of Study

In the framework of Comprehensive Primary Healthcare, this study intends to examine the landscape of point-of-care (POC) diagnostic devices in scoping for six South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, and the Maldives). The study is intended to shed light on the state of POC devices in primary healthcare delivery as it stands presently and identify areas for improvement.

Objective of the study

The objective of the study is to explore the range of point-of-care diagnostics that are currently on the market in different nations to assist policy makers and healthcare service providers in making judgments regarding the use of these POC diagnostics devices in the south Asian nations, primary healthcare.

Data Type : Secondary data
Data collection source: Brands Official Websites, E- Commerce Websites
Study design : cross-sectional
Study Duration : 3months (Feb 2023 –May 2023)
Inclusion criteria: POC, Wearable, Handheld/Portable Devices
Exclusions criteria : Devices which are only used in secondary and tertiary care hospital, SAMD(software as a medical devices), Indian Devices
Sample size : 120 Devices
Limitations :
Study provides information only for POCs adopted for Primary Healthcare.
Cannot generalize the findings because the market is expanding constantly.

Expected Outcome: The type of point-of-care devices that are currently available, their features, and their suitability for adoption in the specified south Asian nations will all be thoroughly covered in this landscape review. This would assist the country's policy makers and healthcare service providers in making judgments regarding the use of these POC devices for primary care.

Result

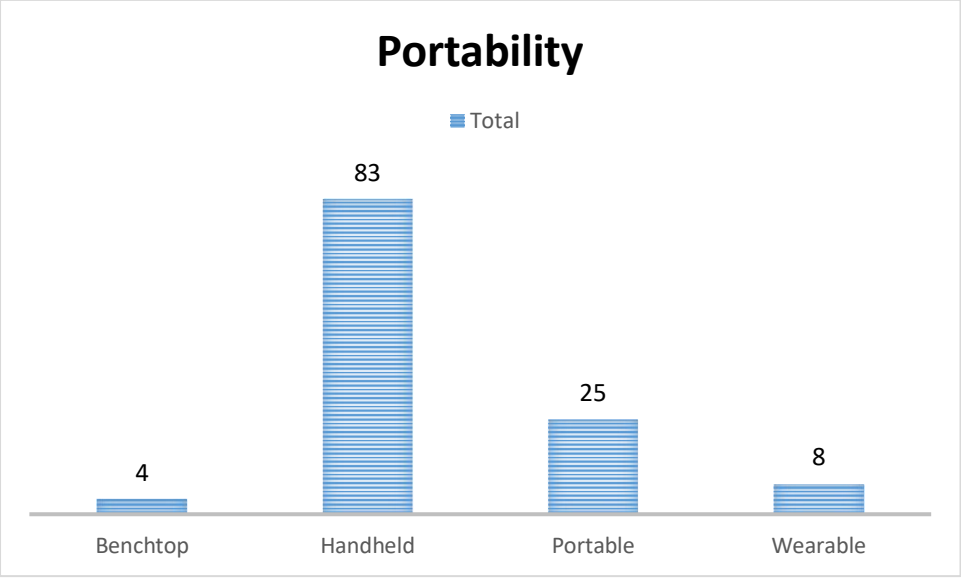
We conducted this study to understand the overall Landscape of POC diagnostics devices being used in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for Comprehensive Primary Healthcare.

According to our research, there are different POC diagnostic devices available in different countries for a variety of medical disorders, such as chronic illnesses, infectious diseases, cardiovascular health, etc. With various technologies.

Findings: Total Devices: 120

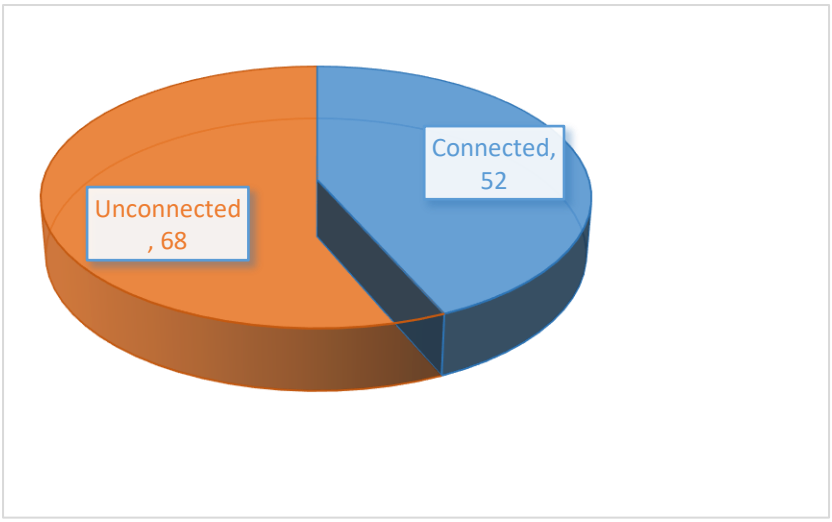
Types of Devices(By Portability)

- Handheld- 83
- Portable- 25
- Wearable- 8
- Benchtop- 4



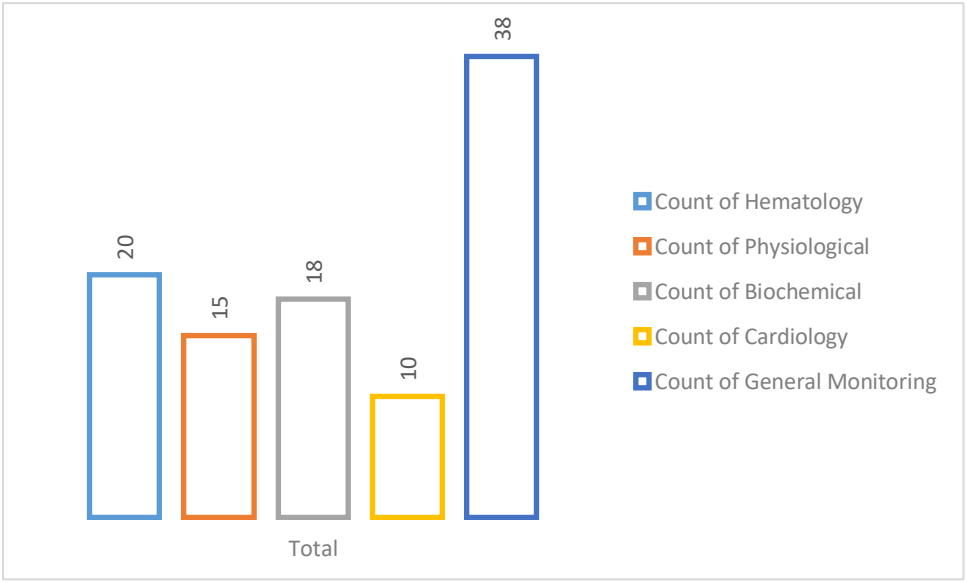
Connectivity:

- Unconnected- 68
- Connected- 52

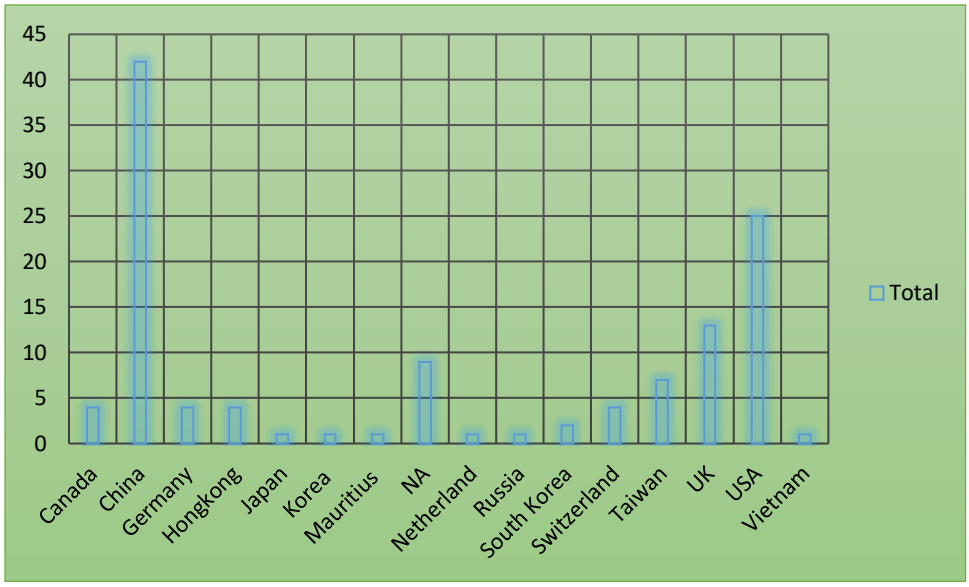


Parameter Tested

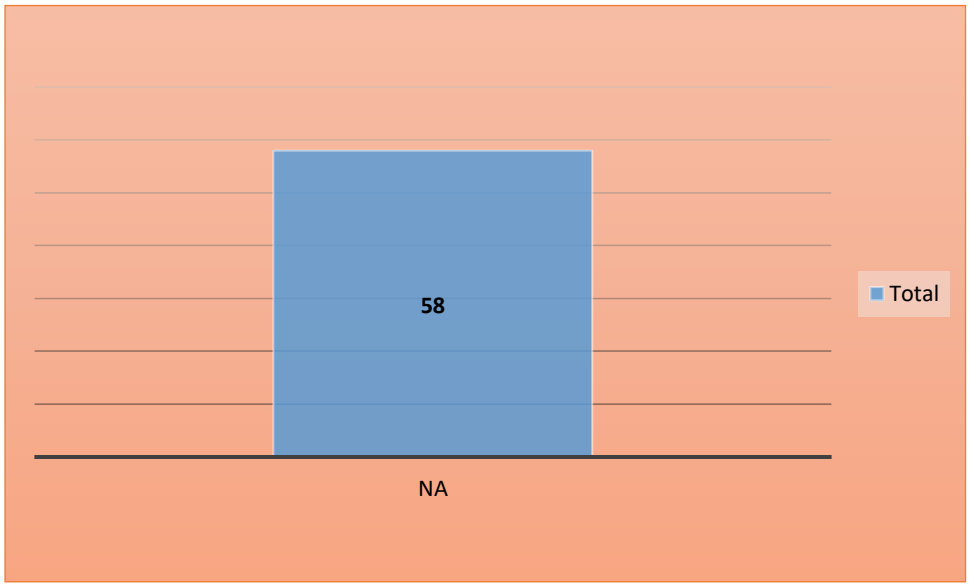
- Hematology- 20
- Physiological- 15
- Biochemical- 18
- Cardiology- 10
- General Monitoring- 38



Manufacture Origin : Among all the manufacturers, most of the devices are Made in China.



Approval Not Available - Out of 120 devices, the certification of approval for 58 devices are not available



Discussion and Conclusion

The landscape of Point-of-Care (POC) diagnostic devices being used in various countries for comprehensive primary healthcare reveals several noteworthy findings. This discussion section highlights key observations, identifies challenges, and proposes potential solutions to enhance the utilization and accessibility of POC diagnostic devices in South Asian countries.

Diverse Range of POC Diagnostic Devices: The study revealed a diverse range of POC diagnostic devices being used. These devices included rapid diagnostic tests (RDTs), portable laboratory instruments, handheld devices, and smartphone application based devices. The availability of such a wide array of devices suggests progress in the

development and deployment of POC diagnostics, catering to various healthcare needs and resource constraints.

Variations in Device Adoption: The study identified variations in the adoption and utilization of POC diagnostic devices among the South Asian countries. While some countries showcased comprehensive implementation and integration of POC diagnostics within their primary healthcare systems, others faced challenges related to device accessibility, affordability, and infrastructure limitations. These variations highlight the need for tailored strategies and policies to address the specific barriers faced by each country.

Importance of Local Context: One crucial finding from the study was the significance of considering the local context when implementing POC diagnostic devices. Factors such as cultural beliefs, language barriers, and regional epidemiology played a substantial role in shaping the acceptance and usability of these devices. Integrating local perspectives and engaging with communities are essential for successful adoption and sustained use of POC diagnostics.

Regulatory Compliance: The landscape study also identified ongoing challenges, including standardization of POC devices regulatory compliance. Compliance with regulatory standards fosters trust in POC diagnostics, promotes quality assurance, and enables effective monitoring of device performance. It is crucial for governments and manufacturers to enforce and adhere to regulatory guidelines to maintain the integrity and effectiveness of POC devices.

In conclusion, overall Landscape of POC diagnostics devices being used in various countries in scope of six of the South Asian countries (Bangladesh, Pakistan, Sri Lanka, Nepal, Afghanistan, Maldives) for Comprehensive Primary Healthcare. reveals a diverse range of devices, variations in adoption, and challenges related to accessibility, adaptability , quality control and diversity . To maximize the potential of POC diagnostics devices.

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Name of Guide/Supervisor	Dr./ Prof.: Anandhi Ramachandran		
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Annexure

S.No	Device	Manufacture/Brand Name	Model Name	Manufacture/ Origin country	Type	Approval	Connectivity	Connectivity Technology	Specific Parameter Tested
1	Armband Heart Rate Monitor	Garmin	Garmin Soft Strap Premium Heart Rate Monitor	Taiwan	Wearable	NA	Connected	Mobile App	Heart rate Monitoring
2	Armband Heart Rate Monitor	XOSS	XOSS HR armband	Hongkong	Wearable	NA	Connected	Mobile App	Heart rate Monitoring
3	Armband Heart Rate Monitor	XOSS	XOSS HR Sensor armband	Hongkong	Wearable	NA	Connected	Mobile App	Heart rate Monitoring
4	Baby Weighing Scale	Beurer	BY-80	China	Portable	NA	Unconnected	NA	Body Weight Monitoring
5	Baby Weighing Scale	Dr Trust USA	Dr Trust Growbuddy	USA	Portable	ISO	Unconnected	NA	Body Weight Monitoring
6	Blood Chemistry Analyzer	Abbot	i-STAT CG4+ Cartridge	UK	Handheld	ISO,CE	Unconnected	NA	Blood Chemistry,Elecrolytes and Blood Gases
7	Blood Chemistry Analyzer	Abbot	i- STAT Chem6+ Cartridge	UK	Handheld	ISO,CE	Unconnected	NA	Blood Chemistry and Elecrolytes
8	Blood Chemistry Analyzer	Abbot	i-STAT Chem8+ Cartridge	UK	Handheld	ISO,CE	Unconnected	NA	Blood Chemistry and Elecrolytes
9	Blood Chemistry Analyzer	Siemens Healthineers	epoc Blood Analysis System	Canada	Handheld	ISO/IEC 27701:2020	Connected	LIS	Blood Gases
10	Blood Chemistry Analyzer	Siemens Healthineers	RAPIDPoint 500e Blood Gas system	Canada	Benchtop	ISO/IEC 27701:2019	Connected	LIS	Blood Gases
11	Blood Chemistry Analyzer	Siemens Healthineers	NA	Canada	Handheld	European CE , USFDA, ISO	Unconnected	NA	Blood gas Analyzer is an equipment for measuring and calculating complete
12	Blood Pressure Monitor	ChoiceMMed	CBlood Pressure1E2	China	Handheld	NA	Unconnected	NA	Blood Pressure Monitoring
13	Blood Pressure Monitor	Dr Trust	Dr Trust Atrial Fibrillation Automatic dual talking Blood Pressure Monitor Machine	USA	Handheld	FDA, CE	Connected	Mobile App	Blood Pressure Monitoring
14	Blood Pressure	Omron	HEM-7124	Vietnam	Handheld	NA	Unconnected	NA	Blood pressure

	Monitor								measurement
15	Blood Creatine Kinase Measurement Device	Abbot	i-STAT CK- MB Cartridge	UK	Handheld	ISO,CE	Unconnected	NA	cardiac marker
16	Blood Pressure Monitor	Beurer	BM-35	China	Handheld	NA	Unconnected	NA	Blood Pressure Monitoring
17	Blood Pressure Monitor	ChoiceMMed	CBlood Pressure2K1	China	Handheld	NA	Connected	Bluetooth	Blood Pressure Monitoring
18	Blood Pressure Monitor	Omron	Omron HEM 6161 Fully Automatic Wrist Blood Pressure Monitor	Taiwan	Portable	NA	Unconnected	NA	Blood Pressure Monitoring
19	Body Composition Monitor	ChoiceMMed	Body Scal S1	China	Portable	NA	Unconnected	NA	Body Weight Monitoring and Calories Intake
20	Body Composition Monitor	Dr Trust USA	Body Fat and Composition Scale Analyzer 2.0	USA	Handheld	FDA, CE	Connected	Mobile App	Body Weight and Composition Monitoring
21	Body Composition Monitor	Omron	Omron HBF 375 body composition Monitor	Taiwan	Portable	NA	Unconnected	NA	Body Weight and Composition Monitoring
22	Breath Functioning Testing Device	Abbot	i-STAT BNP Cartridge	UK	Handheld	ISO,CE	Unconnected	NA	Shortness of Breathe Analyzer
23	Cardiac Assays	Siemens Healthineers	Stratus CS Acute care Diagnostic system	NA	Portable	CAP,JCAHO, CLSI, ISO	Connected	LIS	Cardiac system Analyzer
24	Chest Worn Smart Heart Monitor	Fourth Frontier	Frontier X2	NA	Wearable	CE,ISO	Connected	Mobile App	Heart rate, ECG Monitoring
25	Cholesterol meter	Lysun	LPM-101	china	Handheld	CE,ISO	Connected	Bluetooth	Cholesterol Analysis
26	CK-MB Test Kit	AccuBioTech	Accu-Tell CK-MB Rapid Diagnostic Kit	china	Handheld	NA	Unconnected	NA	CK-MB Analysis
27	Coagulation Detection	Abbot	i- STAT ACT Cartridge	UK	Handheld	ISO,CE	Unconnected	NA	Coagulation Test

28	ECG and EKG Test Device	Dr Trust USA	Dr Trust USA Portable Bluetooth ECG EKG Test Machine 1201	USA	Handheld	FDA, ISO	Connected	Bluetooth	ECG and EKG
29	ECG Machine	ChoiceMMed	MD100E	China	Handheld	NA	Connected	PC	ECG
30	ECG Machine	ChoiceMMed	MD100B	China	Handheld	NA	Connected	USB	ECG
31	ECG Machine	Philips	Philips Effica ECG 100	Netherland	Handheld	FDA	Connected	Mobile App	ECG
32	ECG Machine	Surgical Hub	Contec 3 Channel ECG Machine	USA	Portable	ISO	Unconnected	NA	ECG
33	ECG Machine	VNG MEDICAL INNOVATION SYSTEMR	Encephalan-EEGR-19/26	Russia	Portable	ISO 13485 and ISO 9001	Unconnected	NA	Portable bluetooth enabled EEG (Electro Encephalogram) Machine Machine is used to detect problems in the electrical activity of the brain that may be associated with certain brain disorders
34	Fetal Doppler	ChoiceMMed	MD800C31	China	Handheld	NA	Unconnected	NA	FHR Display and Sound Hearing
35	Fetal Doppler	ChoiceMMed	MD800C5	China	Handheld	NA	Unconnected	NA	FHR Display and Sound Hearing
36	Fitness Band	Dr Trust USA	Healthpal 1 Smartwatch Fitness Tracker 8002	USA	Handheld	FDA, CE	Connected	Bluetooth	Fitness Monitoring
37	Fitness Band	Sony	M4 Fitness Band	Japan	Handheld	NA	Connected	Bluetooth	Fitness Monitoring (Vitals, Sleep)
38	Glucometer	Lysun	BGM-101	china	Handheld	CE,ISO	Unconnected	NA	Blood glucose level
39	Glucometer	Lysun	BGM-102	china	Handheld	CE,ISO	Unconnected	NA	Blood glucose level
40	Glucometer	Lysun	Mini Glucometer 5 Second Accurate	china	Handheld	CE,ISO	Unconnected	NA	Blood glucose level
41	Glucometer	Nova Biomedical	Nova Primary automated	Taiwan	Benchtop	ISO, CE	Unconnected	NA	Blood glucose level

			Benchtop blood glucose analyzer						
42	Glucometer	Nova Biomedical	STATstrip Xpress2 Glucose meter	Taiwan	Handheld	FDA	Unconnected	NA	Blood glucose level
43	Glucometer	Nova Biomedical	STATstrip Glucose Connectivity meter	Taiwan	Handheld	FDA	Connected	Wifi	Blood glucose level
44	Glucometer	Roche Diabetes Care	Accu- check Guide	USA	Handheld	ISO- 15197: 2014	Connected	Bluetooth	Blood glucose level
45	Glucometer	Roche Diabetes Care	Accu- check Instant S	USA	Handheld	ISO- 15197: 2013	Unconnected	NA	Blood glucose level
46	Glucose and ketones Analyzer	Abbot	Freestyle Libre Reader and Sensor	UK	Handheld	ISO, CE	Unconnected	NA	Glucose and Ketone reading
47	Glucose and ketones Analyzer	EKF Diagnostic	STAT site WB	UK	Handheld	ISO,CE	Unconnected	NA	Glucose and Ketone reading
48	Handheld Ultrasound Scanner	Clarius	Clarius HD3	Canada	Handheld	NA	Connected	Mobile App	Ultrasonography
49	HbA1c Analyzer	Abbot	AFINION HbA1c	UK	Handheld	IFCC	Unconnected	NA	HbA1c Analysis
50	HbA1c Analyzer	Benemed (Honkong) Industry Co. Ltd	BM810	China	Portable	CE,ISO	Unconnected	NA	Urine analysis
51	HbA1c Analyzer	QUO-LABR	Quolab A1c Analyzer	Germany	Portable	EU CE, Certification number and date ECREP20220111, ISO 9001 & ISO 13485	Unconnected	NA	Automated & Integrated system for testing and screening of HbA1c, Thalassaemia and Hemoglobinopathy as specified in the category parameters
52	HDL Analysis meter	Lysun	Human Dry Chemistry Analyzer	china	Handheld	NA	Unconnected	NA	HDL Analysis
53	Heart Rate Monitor	XOSS	Vortex Cadence Sensor	Hongkong	Wearable	NA	Connected	Mobile App	Heart rate Monitoring ans sensors
54	Heart Rate Monitor	Magene	H003	China	Wearable	NA	Connected	Bluetooth	Heart rate Monitoring

55	Heart Rate Monitor	XOSS	XOSS X2 HR Monitor Chest strap	Hongkong	Wearable	NA	Connected	Mobile App	Heart rate Monitoring
56	Hemoglobinometer	Acon Labs	Mission Ultra Hemoglobin Testing system	USA	Handheld	CE	Unconnected	NA	Hemoglobin Analysis
57	Hemoglobinometer	Botitech	Homochromax Plus	Korea	Handheld	CE,FDA	Unconnected	NA	Hemoglobin Analysis
58	Hemoglobinometer	Danyang New Hope Medical Equipment	HS-H7	China	Handheld	CE,FDA,ISO	Unconnected	NA	Hemoglobin Analysis
59	Hemoglobinometer	Lysun	BHM-102	china	Handheld	CE,ISO	Unconnected	NA	Hemoglobin Analysis
60	Hemoglobinometer	Nanjing Long Medical Technology	LXW-680	China	Handheld	CE	Unconnected	NA	Hemoglobin Analysis
61	Hemoglobinometer	Nova Biomedical	StatStrip Lactate Hemoglobin and Hematocrit meter	Taiwan	Handheld	CE	Unconnected	NA	Hemoglobin Analysis
62	Influenza A+B Rapid Antigen Test Device	Lysun	Influenza A+B Rapid Antigen Test Device	china	Handheld	NA	Unconnected	NA	Influenza
63	Infrared Thermometer	Beurer	FT65	China	Handheld	NA	Unconnected	NA	Temperaure Monitoring
64	Infrared Thermometer	Beurer	FT-85	China	Handheld	NA	Unconnected	NA	Temperaure Monitoring
65	Infrared Thermometer	Dr Trust USA	Infrared Thermometer 611	USA	Handheld	ISO	Unconnected	NA	Temperaure Monitoring
66	Infrared Thermometer	Dr Trust USA	Model-610	USA	Handheld	ISO	Unconnected	NA	Temperaure Monitoring
67	Lipid Profile and Cholesterol Tester	Abbot	Cholestech LDX Analyzer	UK	Portable	ISO,CE	Unconnected	NA	Lipid Profile and Cholesterol Tester
68	Lipid Profile and Cholesterol Tester	Guangzhou Medsinglong Medical Equipments	MSLBG15	China	Handheld	NA	Connected	USB	Lipid Profile and Cholesterol Tester
69	Multi Parametric	HealthCube	Healthcube XL	USA	Portable	CE, CDSCO,ISO	Connected	Mobile App	Vitals,ECG,HB,RDT

	POC Testing Device								
70	Multi Parametric POC Testing Device	HealthCube	Healthcube Biochem	USA	Handheld	CE, CDSCO,ISO	Connected	Mobile App	Glucose,HB,Cholesterol, Uric Acids
71	Multi Parametric POC Testing Device	HealthCube	Healthcube SE	USA	Handheld	CE, CDSCO,ISO	Connected	Mobile App	Vitals,ECG,HB,RDT
72	Multifunctional Analysis meter (Uric Acid+ Glucose)	Lysun	GUM-101	china	Handheld	NA	Unconnected	NA	Uric Acid, Blood Glucose Analysis
73	Multi Parametric POC Testing Device	AgeWell (Healthcube India Private Limited)	AgeWell Health Monitor	USA	Handheld	CE, CDSCO,ISO	Connected	Mobile App	Vitals
74	Pulse Oximeter	Beurer	PO60	China	Handheld	NA	Unconnected	NA	SPO2 and Pulse
75	Pulse Oximeter	ChoiceMMed	MD300M	China	Handheld	NA	Unconnected	NA	Vitals
76	Pulse Oximeter	ChoiceMMed	Pulse Oximeter OX200	China	Handheld	NA	Connected	Bluetooth	SPO2 and Pulse
77	Pulse Oximeter	Clarity	Oxy plus 240 ST	NA	Portable	ISO,CE	Unconnected	NA	SPO2 and Pulse
78	Pulse Oximeter	contec	Contec Tabletop Pulse Oximeter CMS70A	USA	Portable	NA	Unconnected	NA	Pulse, SPO2 Monitoring
79	Urine Analyzer	Roche	MBROCD0001	Switzerland	Handheld	cULus	Unconnected	NA	Specific gravity, pH. leukocytes. nitrite., protein. glucose, ketones, urobilinogen, bilirubin, blood (erythrocytes/hemoglobin
80	Smart Band	BoAt	Xtend	China	Handheld	NA	Connected	IoT	Stress Monitor, Heart & SpO2 Monitoring
81	Smart Band	Noise	Noise Champ Smart Band for Kids with 7 Alarms (Brush Teeth, Study Time & More),	China	Handheld	NA	Connected	Bluetooth	Fitness Monitoring (Vitals, Sleep)

			Lightweight, Sleep Tracker, 50+ Kids Watch Faces, IP68 Washable (Carbon Black), One Size						
82	Smart Band	Redmi	HMSH01GE	China	Wearable	NA	Connected	Mobile App	General Monitoring
83	Spirometer	contec	SP10	USA	Handheld	NA	Unconnected	NA	PFT
84	Stethoscope	3M Littmann	MBLITTMAN222218	USA	Handheld	NA	Connected	Mobile App	The 3M Littmann CORE Stethoscope connects with Eko software on a smart Device2 to visualize, record and share data.
85	Stethoscope	PCE InstrumentsR	PCE-S 41	UK	Handheld	Compliance to ISO 9001	Unconnected	NA	
86	Stethoscope	3M	3M Littmann Core Stethoscope 8480	USA	Handheld	NA	Connected	Mobile App	Auscultation
87	Stethoscope	3M	3M 5633	USA	Handheld	NA	Unconnected	NA	Auscultation
88	Thermometer	Beurer GmbH	MBDP0007	Germany	Handheld	CE	Unconnected	NA	6-In-1 function -ear, forehead, and surface temperature, temperature alarm, date, and time
89	Thermometer	ChoiceMMed	Wireless Thermometer T1	China	Handheld	NA	Connected	Bluetooth	Temperaure Monitoring
90	Thermometer	Kinsa	kinsa Quick care Thermometer	USA	Handheld	FDA	Connected	Mobile App	Temperaure Monitoring
91	Thermometer	ME N MOMS PRIVATE LIMITED	MM-300 C	China	Handheld	NA	Unconnected	NA	Mee Mee accurate flexible thermometer is made from premium quality material which is safe for the use of baby
92	Ultrasound	Sonoscape	Sonoscape P20	China	Benchtop	US FDA, EC/CE	Unconnected	NA	Radiological Diagnosis of

	Machine					TUV, IEC,ICMED			various conditions
93	Uric Acid Analyzer	Lysun	Portable Uric Acid Analyzer	china	Handheld	NA	Unconnected	NA	Uric Acid Analysis
94	Urine Analyzer	AccuBioTech	Accu- Tell Urine Analyzer (1550A)	china	Handheld	NA	Unconnected	NA	Urine analysis
95	Urine Analyzer	Acculab	AccuDx UA 10	Mauritius	Handheld	NA	Connected	Bluetooth	Urine analysis
96	Urine Analyzer	cobasR	cobas u411	Germany	Portable	ISO 9001 & ISO 13485	Unconnected	NA	Urine chemical analysis or Urine sediment analysis or both chemical and sediment analysis as indicated in the parameters for the category
97	Urine Analyzer	EKF Diagnostic	Uri- Track 120 urine Aalyzer	UK	Portable	ISO	Unconnected	NA	Urine analysis
98	Urine Analyzer	Mindray	Mindray UA66	China	Portable	NA	Connected	PC	Urine analysis
99	Urine Analyzer	Siemens Healthineers	CLINITEK Advantus Urine chemistry Analyzer	NA	Benchtop	ISO, ASTM	Unconnected	NA	Urine analysis
100	WBC Analyzer	Nanjing Jalead International Trading	WBC analyzer Portable	China	Portable	NA	Unconnected	NA	WBC analysis
101	Weighing Scale	Beurer	Bodyshape Diagnostic Scale	China	Portable	NA	Connected	Mobile App	Body Weight and Composition Monitoring
102	Weighing Scale	Beurer	BF-180	China	Portable	NA	Unconnected	NA	Body Weight Monitoring
103	HbA1c Analyzer	Jana Care	Universal reader	USA	Handheld	NA	Connected	Mobile App	HbA1c Analysis
104	Thalesemia Reader	Hemex Health	Gazelle POC device	USA	Portable	NA	Connected	Cloud and API	Sickel Cell diseases and Beta Thalesemia
105	RDT Reader	Audere	Health Pulse	USA	Handheld	NA	Connected	Mobile App	HIV, Malaria, Covid (Other RDTs)
106	Glucometer	Ypsomed	Mylife Aveo, Mylife Unio Neva	Switzerland	Handheld	ISO	Connected	Mobile App	Blood glucose level

107	Glucometer	Roche	Accu-Check Instant	Germany	Handheld	CE, ISO	Connected	Mobile App	Blood glucose level
108	Urine Analyzer	Contec	Contec BC 401	China	Handheld	NA	Unconnected	NA	Urine analysis
109	Thermometer	Microlife	NC 150 BT (Non contact thermometer)	Switzerland	Handheld	CE	Connected	Bluetooth	Vitals (Temperature)
110	Blood Pressure Monitor	Microlife	BP A7 Touch BT	Switzerland	Portable	CE	Connected	Bluetooth	Vitals (BP)
111	ECG Machine	Beurer	ME90 Bluetooth	China	Handheld	NA	Connected	Bluetooth	ECG
112	Urine Analyzer	Cybow	CYBOW R-50S	South Korea	Handheld	CE	Connected	Bluetooth	Urine analysis
113	Hemoglobinometer	Veri-Q	Hb Mate	South Korea	Handheld	NA	Unconnected	NA	Hemoglobin Analysis
114	Hemoglobinometer	EKF Diagnostic	DiaSpect Tm Handheld Hemoglobin Analyzer	UK	Handheld	NA	Connected	Bluetooth	Hemoglobin Analysis
115	Hemoglobinometer	Acutek	HBS-102	NA	Handheld	CE	Unconnected	NA	Hemoglobin Analysis
116	Baby Weighing Scale	PHOENIX	Digital Baby Weighing scale (NBY Series)	NA	Portable	ISO	Connected	USB	
117	Stadiometer	Samson Charder	HM210D (Digital Height Measuring Machine)	NA	Portable	NA	Unconnected	NA	Height Measuring
118	Stadiometer	ADE	MZ10020 Ultrasonic Digital height measuring rod	NA	Handheld	NA	Unconnected	NA	Height Measuring
119	Stadiometer	NA	Digital Stadiometer with Bluetooth	NA	Handheld	NA	Connected	Bluetooth	Height Measuring
120	ECG Machine	Cardiac Insight	Cardea 20/20	USA	Portable	NA	Connected	Bluetooth	ECG