

Proposal of National Cancer Control Plan, Yemen "NCCP" 2023-2027

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Abstract:- National planning for cancer control is the most effective way to address the cancer problem in Yemen. Each country has its own characteristics in terms of cancer burden, cancer and risk factors, culture, health system, and available financial and human resources as well. As infrastructure it must be carefully evaluated in order to establish realistic and achievable business priorities. The Ministry of Public Health and Population in Yemen has started the process of preparing the document “National Cancer Control plan in Yemen” (NCCP-Y) “in January 2006, and it was amended in 2007. But this document did not see the light, then events and local and Arab popular interactions followed, and at a time when there were no oncology centers other than the National oncology Center in Sana’a, no specific strategy or plan was implemented. The National Program of Cancer Control preparing the proposal of national plan for cancer control in Yemen in line with the framework of the World Health Organization and the Regional Office for the Eastern Mediterranean, with specific goals and objectives. The goals are to control cancer, reduce incidence, control mortality, and improve outcomes and quality of life for cancer patients.

Keywords:- Cancer Control Plan, Yemen, Burden of Cancer, Treatment Guidelines

I. INTRODUCTION

The World Health Organization (WHO) recommends that all countries with a large proportion of the cancer problem, national cancer control planning organize work within the framework of the national cancer control program (NCCP).

(NCCP) “is a public health program designed to reduce the number of cancer cases and deaths and improve the quality of life for cancer patients through the systematic and equitable implementation of evidence-based strategies for prevention, early detection, diagnosis, treatment and palliative care, and optimization of available resources. The National Cancer Control Plan evaluates methods of various disease control and program implementation is most cost-effective and beneficial to the majority of the population.

The development of treatment guidelines enhances the focus on preventing cancers or detecting cases early so that they can be treated, and providing the greatest possible comfort for patients with advanced diseases.”

A. WHO Study “National Cancer Control Programmes: Policy and Management Guidelines, Second Edition, World Health Organization, 2002” (1) , Provides A Framework for Developing these Programs. the Planning Process to be Undertaken Should Follow Four Basic Steps:

- Estimate the extent of the cancer problem
- Setting measurable targets for cancer control
- Evaluation of potential cancer prevention and control strategies
- Giving priority to primary cancer control activities

II. BURDEN OF CANCER IN YEMEN

A. Current Situation

The situation of cancer patients in Yemen is the most suffering, as their suffering extends even before the conflict, as they suffer from a great inability to bear the cost of treatment. Available and scarce statistics indicate that the size of the cancer problem and the high incidence of cancer is the second largest disease causing death by 16.6% after cardiovascular diseases. The health system suffers from weakness and many problems that have been exacerbated by the ongoing conflict as well as epidemics and pandemics (Covid 19), which has increased a burden on the weak health system and led to a severe weakness in meeting the minimum needs, care and treatment of cancer patients.

The World Health Organization estimated that in 2016, 13.4 percent of deaths related to non-communicable diseases were caused by cancer in Yemen. In 2020, there were an estimated 16,476 new cancer cases and 12,103 deaths.

The most common ten cancers in Yemen according to oncology cancer report 2021 are: Breast cancer, Leukemia, Colorectal, Lymphoma, Head and Neck, Gastric, Thyroid, Brain and CNS, Ovary and Prostate cancers.

B. Cancer Mortality Rate:

Cancer deaths in Yemen for the year 2020 were estimated at 12,103 deaths, 76.5 ASR (global) per 100,000. The results showed a convergence between males and females (77.9 vs 76.1 ASR (world) per 100,000, and total deaths 6436 vs 5667, respectively) (IARC 2021). Among the sites of cancer incidence, breast cancer ranked first in mortality rates (12.1%), followed by colorectal (10.0%), stomach (9.7%), leukemia (8.6%), and esophageal (8.3%), and the liver (6.5%). Lung (6.2%), brain and central nervous system (6.0%) and non-Hodgkin's lymphoma (3.2%) (ICCP 2020) This high death rate is especially among cancers considered curable such as breast cancer and colorectal cancer. Due to some culture and poor access to health care services for the diagnosis and management of cancer, it presents in the late stage of the tumor and therefore has a poor prognosis in general. (2-4)

C. The Most Cancer Diseases Suffering For The Patient And The Country

➤ Breast cancer

Data on breast cancer from the main cancer registries in Yemen NOC, ACR and Hadramout Cancer Registry (HCR), Hadhramaut Valley and the Desert Oncology Center (HVDOC) showed varied in the number of cases reported by each registry and ranged from 17.5% to 31.6% with most local researchers suggesting that this type of cancer affects Yemeni women younger than women in other countries. Western Region at least one decade in which about 70% of women were aged 50 years or younger at the time of diagnosis and the most common age group affected was 41–50 years. IDC was the most common disease with 76% and 79% of patients having lymph node involvement at the time of diagnosis. [5,6]

We can estimate the decrease in breast cancer incidence in our country compared to high-income countries due to a number of factors such as different reproductive factors, as well as fertility rates, preterm births and lactation in Yemeni women compared to women in western countries. The improvement that oncology centers in Yemen observed in the diagnosis and treatment of breast cancer in 2019-2020 played an important role in the early detection of breast cancer as ultrasound machines and mammograms were introduced in some centers, which helped in the early detection of breast cancer. As well as the development of diagnostic and operating techniques for examining ER, PR and Her 2, and this necessitates the need to add other devices in the newly developed centers for mammography, as well as equipping pathology laboratories for some oncology centers. The program also works in coordination with the World Health Organization to provide targeted treatment to oncology centers, which has a positive role in improving patients' survival. [7]

➤ Head and Neck Cancers

Head and neck cancers mainly appear in the lower socioeconomic classes, which makes them more common among Yemenis. Smokeless tobacco (sniffing and citrus), as well as qat treated with chemicals and pesticides, play an

important role in the pathogenesis of head and neck cancer. The risks may increase in Yemen in proportion to the intensity and duration of exposure to each carcinogenic substance (qat, snuff, shammah). [8-10]

The majority of head and neck cancer cases were recorded in the 50-59 age group (27.9%), followed by the 60-69 age group (20.8%) and less common in the 0-9 and 10-19 age group. For two years (1.1% and 3.3%), respectively, the most common site was the oral cavity (31.7%), followed by pharyngeal cancers (22.9%) and laryngeal cancers (19.1%). [11]

The National Program of Cancer Control considers a necessary and regular free oral care examination for all consumers of qat, snuff and zardh with the support of the World Health Organization and the Yemeni Ministry of Public Health and Population.

➤ Gynecological cancers

In developing countries such as Yemen, routine cervical cancer screening is rudimentary; Hence, there is a high incidence of cervical cancer due to the lack of awareness of cervical cancer in the population and the absence or poor quality of the screening programme. The mortality rate from cervical cancer is high in Yemen, and most cases are diagnosed at a late stage of the disease. In fact, due to the lack of sufficient national records. Although the prevalence of HPV is unknown in Yemen, data from neighboring countries have shown an increasing burden. HR-HPV31, HR-HPV33, HR-HPV35, HR-HPV39, and HR-HPV45 are prevalent among Yemeni women with cervical cancer. Moreover, there is an urgent need to take strategic measures and plans to reduce the burden of cervical cancer in Yemen. [12]

Ovarian cancer is the most common type of cancer of the female reproductive organs and a leading cause of death from malignant tumors of the female reproductive system. Most patients with ovarian cancer have advanced stages due to non-specific symptoms of the disease. Ovarian cancer has the highest mortality rate in Yemen because two-thirds of cases are in advanced stages. [13]

In May 2018, the Director-General of the World Health Organization, Dr. Tedros Ghebreyesus, issued a global call to eliminate cervical cancer at the World Health Assembly. Ending cervical cancer is a priority within the framework of the Thirteenth General Program of Work of the World Health Organization (GPW) and will contribute to achieving the 2030 Sustainable Development Goals and the United Nations Global Strategy for Women, Children and Adolescents (2016-2030). We are confident that the continuous support of the World Health Organization will result in improving and developing cancer control programs in the Republic of Yemen and saving thousands of patients from cancerous diseases. [14]

III. CANCER REGISTRY IN YEMEN

Cancer registration centers affiliated with oncology centers play an important role in health policy development, monitoring and implementation if they fulfill their role. Because rational planning is not possible without the possibility of recognizing essential health problems, prioritizing preventive and curative programs, evaluating the achievement of goals in the target groups and comparing them with what has been achieved in relation to the resources expended. The primary function of Can Reg in relation to cancer control is to assess the current size of the cancer burden and its potential future development. Although the stated policy in Yemen was to develop a network of PBCRs serving five cancer registration centers for the time being, five cancer registries were doing little to collect data on cancer patients and analyze outcomes : Aden Cancer Registry (leading in the country since 1997), Hadhramout Cancer Registry in Mukalla and Wadi Hadramawt, Desert Cancer Center (HVDOC), National Cancer Center in Sana'a, the most recent of which is the Cancer Registry in Taiz and Shabwah, however, all These registries often suffer from inadequate health services, transient populations, lack of financial resources, shortage of qualified workforce, insufficient or inaccurate data due to incomplete coverage, difficulty in establishing a reliable and reasonable cancer registry in the country, and difficulty in obtaining data on cancer mortality. , and it is clear that the situation is not satisfactory until the next steps are achieved in the registration stage at diagnosis and estimation of survival rates for specific types of cancer, which requires expanded and dedicated cadres, and a change in working methods to lag behind the comprehensive national registration. We believe that supporting training and rehabilitation programs for the staff of cancer registration

centers and developing the electronic network to connect and rehabilitate all the center during the period 2021-2025.

Future expectations Planning must take into account not only the current situation, but how it is likely to develop in the future.

The United Nations projections for the population of Yemen in 2020 are 53 million. Population growth, increasing aging of the population inevitably leads to more cases of cancer. Also allowing for a very modest increase in infection rates (0.5% per year), so the total number of new cases expected in 2030 will double. Unfortunately, in the absence of any information on incidence trends for any particular type of cancer, we can only speculate about the growth in numbers of different cancers within this estimated total.

Table 1: Distribution of all Cancers According to 5 Oncology Cancer Centers During 2016-2020

	Oncology Center	Male	Female	Total	%
1	National oncology center, Aden	1840	2510	4350	33.9
2	Al-Amal Oncology center, Taiz	1389	1781	3170	24.75
3	National oncology center, Mukala	1517	1701	3218	25.1
4	National oncology center, Sayoun	669	733	1402	10.94
5	National oncology center, Shabwah	321	349	670	5.3
	Total	5736	7074	12810	100

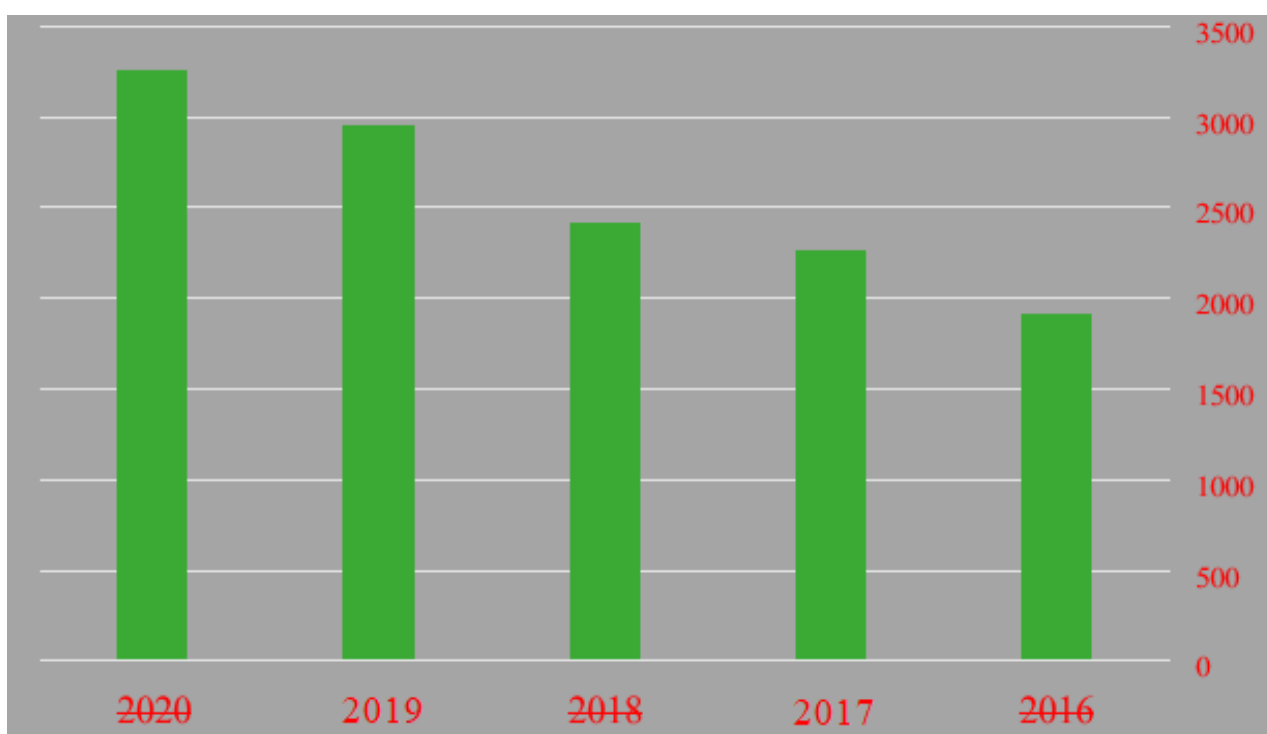


Fig 1 Cancer patients registered for chemotherapy in 5 oncology centers 2016-2020

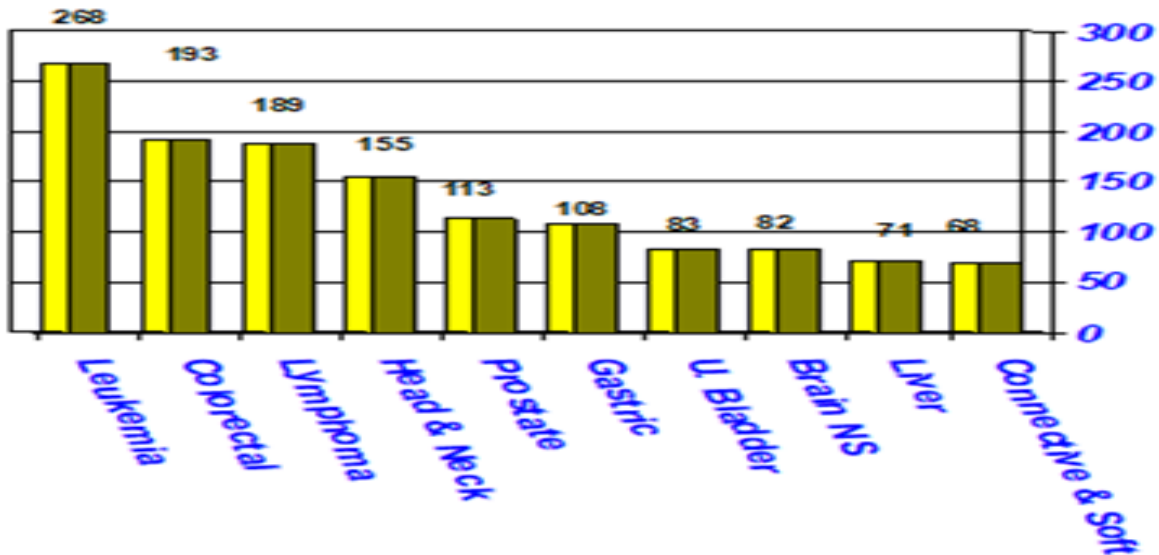


Fig 2 Most common cancers in male. Aden, Taiz, Hadramout and Shabwah oncology centers 2021

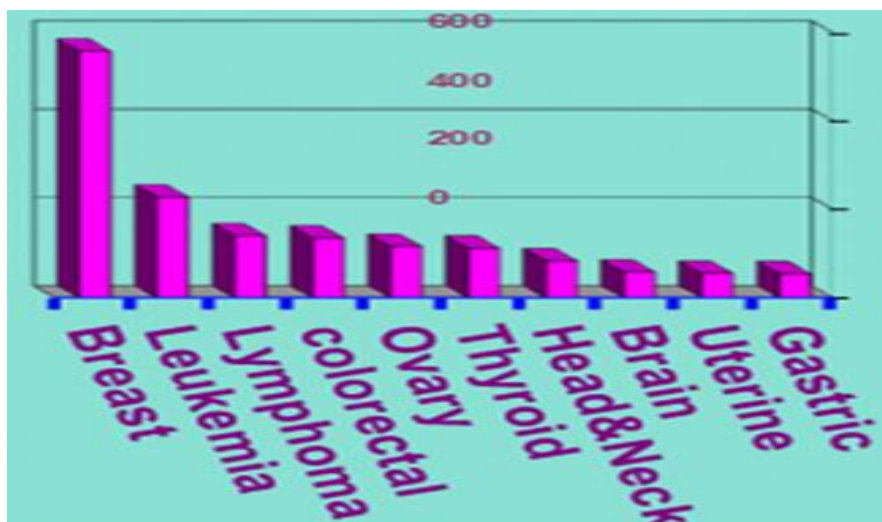


Fig 3 Most common cancer in female in Aden, Taiz, Hadramout and Shabwah oncology centers 2021

IV. CANCER SERVICES IN YEMEN

A. Preventive:

➤ *Tobacco Control:*

Yemen signed (2003) and ratified (2006) the Framework Convention on Tobacco Control (FCTC). A general law was passed In 2005 (Law No. 26) “Concerning tobacco control and treating its complications. The law provides for the implementation of several provisions of the FCTC, including the ban on smoking in public places, on advertising, warnings on products, import restrictions, implementation of education and awareness programs and the allotment of 1% customs and tax duties for tobacco control (including treatment) provisions . Nowadays, the regulations necessary for its implementation are drafting many of these provisions.

Abdul Hamid et al reported that the majority (83.8%) of lung cancer cases were smokers. [15]

In 2007, a Tobacco Control Department was established in the Ministry of Public Health and Population. It has 3 employees, but it is planned to expand to 12. Tobacco control advertising material has been prepared for various media (including TV footage), And anti-tobacco messages are included in one very popular TV series. The World No Tobacco Day is celebrated annually in various governorates with the aim of increasing public awareness of the dangers of tobacco.

➤ *Vaccination:*

Chronic infection with hepatitis B virus (HBV) and hepatitis C virus (HCV) is an important cause of hepatocellular carcinoma (HCC). The incidence of hepatitis B surface antigen (HBsAg) was 18.5% in healthy subjects and 24.1% in patients with chronic liver disease (p=0.03). Studies found evidence of no signs of hepatitis B virus (HBV) infection in 59.8% of healthy individuals and 75.9% of patients with chronic liver disease (p=0.0016). Studies also showed the presence of HBeAg in 32.1% of HBsAg-positive pregnant women, confirming that vertical transmission may play a role in the formation of the HBV

carrier group [16]. Hepatitis B vaccine has been part of the routine infant immunization program since 2000 and coverage is 85%.

The HPV vaccine, also known as the cervical cancer vaccination, is given with the goal of avoiding infection with certain types of HPV. This vaccine provides protection against two, four or nine types of HPV. The program is working to address the World Health Organization to provide this vaccine.

➤ *Early detection / screening*

A very limited screening for cervical cancer is done by individual request of women's departments for the work of (PAP SMEAR)) and tumor centers have witnessed the introduction of ultrasound, mammogram and MRI-Coil, which helped in the early detection of breast cancers.

B. Radiotherapy

The standard requirement of radiotherapy machine is one machine for 3 million of population. There are significant restrictions on access to care. Access to radiotherapy is limited in Yemen and restricted to Sana'a. There is low professional training for health care providers. Only one center in Yemen is responsible for implementing palliative radiotherapy, however, it does not meet the long waiting list for patients who wait for a long time (up to 4 months). Many patients from governorates prefer to travel to Egypt, Jordan or India as patients suffer a lot. made up

The equipment available at the National Cancer Center in Sana'a is a cobalt machine, a simulator (the old traditional Toshiba 1) and CTS-sim (Philips) [17]

During the year 2020, the Cancer Patients Support Fund provided support to the National Center in Sana'a, with an accelerated line that covers patients in Sana'a and the neighboring governorates.

C. Chemotherapy

During the years 2017-2020, it was agreed with the King Salman Center and the World Health Organization to provide 40% of the basic list of chemotherapy and wave therapy for breast cancer and lymph nodes, provided that the state commits to providing 60% and actually 80% of the agreed list was provided, and treatment is provided to all centers in accordance with the treatment systems and programs according to international protocols, all treatments are given free of charge to all patients. The remaining 20% constitutes modern, targeted, biological, high-cost treatment that requires support from the Ministry of Finance so that the oncology centers can provide integrated services. [7]

Oncology centers also offer all examinations, which include tumor markers, free of charge. In the field of breast cancer care, the centers began establishing breast cancer care units and providing mammograms and ultrasounds to provide free services to all patients. A number of associations (Aden Cancer Society, the National Cancer Control Foundation, Hadhramout Cancer Foundation and a

number of other associations) contribute to awareness programs.

D. Nuclear Medicine Centers in Yemen

➤ *Nuclear Medicine Center at Al-Thawra Hospital, Sana'a*

It was providing the services to all cancer patients in the Republic of Yemen in the diagnosis and treatment of radioactive materials, It contains a gamma camera.

Currently, it has stopped providing the service to not allow the provision and transfer of radioactive materials to Yemen, and secondly, due to the migration of all nuclear medicine specialists out of Yemen due to the war.

➤ *Nuclear Medicine Center in Aden, located in Al-Sadaqa hospital,*

No service was provided to patients due to the failure to install the gamma camera device by the relevant authorities in the International Atomic Energy Agency and the Hungarian company from which the device was purchased, in addition to the Hot laboratory device, which is still present at the headquarters of the National Atomic Energy Commission, in addition to the fact that the operational budget of the center has not been approved until today.

The urgent requirement of PET-CT scan for diagnosis, evaluation and follow up is mandatory reduce the traveling to Egypt, Jordan and India and reducing the suffering of traveling in search of PET CT scan device or a dose of radioactive iodine.

E. Diagnostic Services

Diagnostic pathology services are provided in all centers free of charge and include laboratory tests, x-rays, ultrasound, mammogram and blood bank services. Histology and cytology laboratories have been introduced to some centers, and preparations are underway for other centers. CT and MRI machines Most major hospitals are located within the framework of subsidized centers for oncology patients.

F. Rehabilitation, Pain Control, Palliative Care.

Physical rehabilitation centers exist, but there are no specialized services for pain control or palliative care in Yemen. Opioids (eg oral morphine) are provided by the Drug Supply Program.

G. Societies and Foundations Working in the Fight Against Cancer

There are Four Ngos Dedicated to Providing Services Related to Cancer Control in Yemen

- Aden Cancer Society (1988).
- The National Cancer Control Foundation (established in 2002 as a charitable foundation to support cancer patients)
- Hadhramout Cancer Control Society (2006).
- Pediatric Oncology society Aden
- Al-Resalah Seiyun Hadramout Foundation (2021)
- Shabwah Cancer Foundation (2022)

The Areas in which Ngos can Make a Significant Contribution, in Cooperation with the Government, are:

- Public awareness campaigns
- Production of health educational materials.
- Supporting scientific work including establishing and funding support for cancer registries
- Hospice care / palliative treatment
- Patient and family support

V. OBJECTIVES OF THE NATIONAL CANCER CONTROL STRATEGY

A. General Objectives:

- To reduce cancer incidence and mortality and improve quality of life
- To ensure that priority cancer prevention and control services are provided in an equitable (i.e. accessible to all) and sustainable manner

B. Specific Goals

- Work to reduce the incidence of tobacco-related cancer
- Work on enacting regulations limiting the spread of smoked and oral tobacco (shamma) use
- Work to reduce exposure to secondhand smoke
- Developing regulations that will help reduce the incidence of cancer resulting from exposure to professionals and environmental carcinogens.
- Work on developing prevention to reduce the incidence of cancers due to infections
- Develop areas of early detection to reduce breast cancer deaths.
- Work to raise awareness of the early signs and symptoms of breast cancer among patients and healthcare providers, and develop early referral programs to oncology centers and specialized clinics to ensure prompt diagnosis, treatment, follow-up and rehabilitation when needed for cancer cases that are developing result from the early detection strategy.
- Develop a mechanism to provide on-demand diagnostic, treatment and rehabilitation resources for all types of cancer
- To ensure high healing potential or significant life extension following the protocols outlined
- Relieves moderate/severe pain and physical problems in advanced cancer patients
- and psychological
- To improve access to pain management and supportive care for advanced cancer patients, especially at home and at the primary health care level.
- Develop a cancer surveillance and monitoring system that can provide the information needed for NCCP planning and evaluation.
- Promote the expansion of the existing cancer registry network to provide 8-10 population-based cancer registries
- Increasing research capacity in priority areas for cancer control in Yemen

VI. COMPONENTS OF THE NATIONAL CANCER CONTROL PLAN IN YEMEN

A. The Following are the Main Components of the Yemen National Cancer Control Plan (NCCP-Y):

- Prevention
- Early detection
- Diagnosis and treatment.
- Palliative care and rehabilitation
- Surveillance and monitoring
- Cancer Control Research

B. Prevention:

Prevention programs, which involve reducing or eliminating population exposure to causes of cancer and promoting lifestyles known to prevent cancer. Prevention is the most cost-effective and long-term method of fighting cancer that offers the best possible approach and the greatest public health impact.

C. Tobacco Control:

- As previously explained, Yemen has ratified the Framework Convention on Tobacco Control (FCTC), and issued a law to implement many of its provisions. opposite
- How was the tobacco control unit established in the ministry? Despite these activities, much is still being done within the Ministry of Health and Population as well as by other government departments and NGOs.
- Information about the prevalence of smoking in Yemen is relatively scarce, with very little correct information. Population surveys, unrest and internal wars have negatively affected the implementation of procedures.
- The WHO and EMRO Country Profiles for Yemen give the following:
 - The prevalence of use among adults in 2004 was 27% in men and 10% among women. According to data from the World Health Organization and UICC Globalink, the prevalence of smoking among men is 77% and women, 29%. [18,19]
 - This sounds implausible, and the best local survey data, from the Household Health Survey in 2003, the prevalence of smoking among adults (over the age of 15) was found to be 34.5% among men, and 12.8% among women, with very little difference between urban and rural populations. In addition to smoking, oral tobacco use as 'Shama' is said to be relatively common in Hajjah, Al Mahwit and Hodeidah governorates (although there are no accurate statistics on the prevalence of use). Oral leukoplakia is found to be much more common. [20]
- Tobacco control within NCCP-Y will include actions in several areas:
 - Education
 - Taxes
 - Legislation: Health warnings and restrictions on advertising
 - No smoking in public places and transportation.
 - Establishment of smoking cessation clinics in various health services.

D. Strategies to Combat Smoking:

➤ School/Education Level Information:

➤ The curriculum should include improving knowledge of the risks of tobacco, through the media from:

- Short stories,
- Science and religion courses.
- Create student anti-tobacco groups with teacher support.
- Develop a topic on tobacco control in the form of short talks, brochures and posters.
- Responsibility: The Ministry of Education must coordinate with the school administration to implement these activities. NGOs can make a significant contribution, by forming groups of volunteers

➤ Information at the community/education level:

Information on tobacco control should be widely disseminated through the media (especially including television), the press, mosques and universities.

- Responsibility: Ministry of Information, Ministry of Public Health (tobacco control unit with health offices and oncology centers), anti-cancer and tobacco associations and local universities.

➤ Tax collection:

Steady increase in taxes imposed on tobacco products, whether locally produced or imported. As stipulated by the 2005 law, 1% of customs revenues, tax duties, and fines imposed on organizations that violate legal provisions, should be allocated Tobacco control activities (including treatment of tobacco-related diseases). Implementation of these provisions of the law would make a significant contribution to reducing morbidity and mortality from tobacco-related diseases Liability: Ministry of Finance, House of Representatives, Office of the President.

➤ Legislation and Oversight:

To ensure that the necessary regulations target restrictions on advertising and sponsorship, smoking in public places, health warnings, sales to minors, as defined in the 2005 law, and work to ensure increased compliance and enforcement of legal provisions.

- Responsibility: The Yemeni Parliament, the Ministries of Justice and Interior, and the local councils of directorates and municipalities

➤ Establishing smoking cessation clinics in various health services.

- At the national level, a number of clinics should be established in the main public hospitals in the following cities: 2 in Sana'a (Al-Thawra Hospital and Al-Jumhuri Hospital), and 2 in each of
- Aden (Al-Jumhuriya Teaching Hospital), Al-Sadaqa, Taiz (Al-Jumhuri Hospital), Hadhramaut (Ibn Sina) hospital and the bodies of Ibb, Al-Hodeidah, Lahj, Abyan and Shabwah.
- Short training courses are of paramount importance for ten doctors. Formatting should be

- It was established to manage and refer cases between smoking cessation clinics, internal medicine clinics and oncology clinics.

- Clinics must be able to provide appropriate support for people wishing to quit, including pharmacological agents known to be helpful (nicotine patches, chewing gum, tablets, etc.).

- Responsibility: Ministry of Public Health, Interior and related NGOs.

➤ Hepatitis infection

- Good infant vaccination coverage is important to maintain protection against hepatitis B - while correct, sterile methods of injection, blood transfusion, and blood testing for HBV and HCV are routine preventive measures.

- Responsibility: Ministry of Public Health, central laboratories and blood banks.

➤ HPV Vaccine

- The HPV vaccine, also known as the cervical cancer vaccination, is given with the goal of avoiding infection with certain types of HPV. This vaccine provides protection against two, four or nine types of HPV.

- Responsibility: Ministry of Public Health, Oncology Centers and the World Health Organization (WHO)

➤ Diet, physical activity and obesity.

- Dietary intake patterns influence the risk of many types of cancer, particularly gastrointestinal and, to a lesser extent, breast cancer. Overweight and obesity risk of developing cancers of the large intestine, breast (postmenopausal), and endometrial (uterine) cancer. Despite the lack of studies in Yemen on the role it plays. Additionally, subjects pay meticulous attention to nutrient intake, levels of physical activity, or even population height/weight. The World Health Organization estimates the prevalence of being overweight (BMI >25 kg/m²), with a prevalence of 24.6% in men and 27.8% in women, and obesity (BMI 30 kg/m²).

- or more) 2.0% of men and 4.4% of women. However, daily observation indicates a gradual deviation from the dietary pattern from normal eating based on whole grains and simple cooking methods towards more adoption of the Western dietary pattern.

➤ The following activities are recommended in this field:

- Awareness of the public about healthy diet and ideal body standards through the development of health education materials.

- Encouraging physical exercise in schools and sports activities facilities for adults.

➤ *Action steps and action plan:*

- Develop brochures, posters, informational programs and school curricula to promote healthy eating and a more active lifestyle to prevent cancer.
- Provide patients and their families with detailed information and printed materials that explain the nutritional adjustments needed before and during chemotherapy to demonstrate its effect.
- Activating exercise sessions in schools and establishing them appropriately in clubs for regular practice.
- Establishment of free public places suitable for practicing sports (such as walking paths, swimming areas, etc.) in addition to the establishment of more organized centers for physical exercise at a cost affordable to the majority of people.

➤ *The responsibility:*

Ministry of Public Health (Family Health Department, Health Education Department), Ministry of Information, Ministry of Education, Ministry of Youth and Sports.

➤ *Chewing Qat and the effects of pesticides*

- A notable feature of Yemeni culture is the chewing of qat, a large, slow-growing qat evergreen shrub, *Catha edulis*. Qat leaves contain amphetamine-related structural alkaloids, which are currently chewed daily by a high proportion of the adult population in all Yemeni governorates and have a mild stimulant effect. Qat central pleasurable stimulant properties are widely believed to improve working capacity, and it is used on expeditions and by students preparing for exams and confronted with fatigue. Khat leaves also contain significant amounts of tannins (7-14% in dried material), vitamins, minerals and flavonoids. [21]
- The cost of qat is important to the Yemeni economy because it takes a large amount of water to grow and is seen by many as reducing people's productivity.
- The direct cost per person is also significant. It should be noted that qat is routinely sprayed with harmful pesticides by farmers; Besides posing a strong health risk in themselves, pesticides are believed to pose a strong health risk in their own right, and pesticides are believed to exacerbate the ill effects of chewing qat.
- Evidence linking qat use to cancer is scant and circumstantial, although it does exist.
- Some suggestions are that oral leukoplakia (possibly precancerous) is more common in qat users. Since qat users are often tobacco users, a distinction can be made between the rarely addressed and their separate effects. qat leaves appear to contain nothing specific for carcinogens (no evidence of carcinogenic tannin, for example), nor has it been formally evaluated (for example, by the IARC), as a human carcinogen. Miscellaneous indirect mechanisms (eg mucosal thickening, gastric reflux) have been suggested as potentially increasing the risk of upper gastrointestinal cancers. [22]

➤ *Action steps and operational plan:*

- The World Bank has prepared a set of proposals for actions to reduce qat consumption.
- They include increasing the tax burden, building public awareness, teaching in schools, changing public policy (eg in working hours), filling knowledge gaps and diversifying the crop

➤ *The responsibility:* Ministry of Information, Ministry of Public Health (Health Education Department) and local councils.

➤ *Early detection and examination:*

- By diagnosing cancer at an early stage, the chance of dying from that cancer can be reduced. This can be achieved through early diagnosis of symptoms of the disease in patients with cancer already. Screening, on the other hand, aims by applying special tests to asymptomatic individuals to detect cancer without symptoms.
- In the case of cervical cancer, the test (pap smear) aims to detect Pap smear.
- Properly organized screening programs for cervical and large intestine cancer
- (Colon and rectum) are effective in reducing the mortality rate of
- These cancers (and in the case of cervical cancer) however, the incidence of these diseases is very low in Yemen. [12, 23]

E. *Early Detection*

➤ *Breast cancer:*

- Breast cancer is the most common type of malignancy in Yemen and the leading cause of death from cancer.
- Breast cancer data from the main cancer registries at oncology centers in Aden, Mukalla, Taiz, Seiyun and Shabwa showed differences in the number of cases reported by each registry, ranging from 13.8% to 22% according to the tumor center reports.
- According to previous studies, the incidence of breast cancer in Yemen is lower than in developed countries, and through statistics on the number of new cases, we have seen an increase in the number of breast cancer cases at a younger age and more advanced disease than women in western countries at least a decade ago. At the time of diagnosis the most common age range was 41 to 50 years and about 73% of women were aged 50 or younger. The most common type of breast cancer was IDC disease, with 76% and 79% of patients having lymph node involvement at time of diagnosis.
- The lower incidence of breast cancer compared to high-income countries is likely related to a number of different reproductive factors such as fertility rates, preterm birth and length of breastfeeding in Yemeni women, in contrast to women in Western countries. Techniques of breast cancer diagnosis and treatment in tumor centers in Yemen have relatively improved in 2019-2020 as ultrasound and mammography equipment has been introduced in some centers and the role of associations and institutions involved in cancer control has been strengthened at the opening of screening clinics

that aided in the early detection of breast cancer; and the development of diagnostic and treatment technologies. Working on the development of tissue laboratory techniques and examination plays an important role in treatment. The addition of 6 mammography devices and the development of tissue laboratories with modern technologies will play a positive role in improving the response rate to treatment. With regard to oncology centers, the National Cancer Control Program worked in coordination with the World Health Organization to provide targeted treatment to oncology centers, which has a positive role in improving patients' condition, but the introduction of targeted and biological treatment according to international rules is the responsibility of the national program and the Ministry of Health.

➤ *Action steps and operational plan*

- Public awareness of the nature and importance of breast cancer and how to detect it early (training in breast self-examination), and information on medical services for diagnosis and treatment
 - Raising awareness of breast cancer nurses and doctors in primary health centers. The natural history of the disease, early signs and symptoms, how to detect early, clinical breast examination, and clinical stage of breast cancer and appropriate referral practices and treatment outcomes.
 - Establishing ultrasound-equipped diagnostic centers in selected cancer units/hospitals
 - (and mammography), and staffed by trained personnel.
 - Provide education about other types of cancer where they are likely to be detected early and enhance the prospects for treatment, especially colorectal cancer, oral cancer and cervical cancer .
- *The responsibility:* Ministry of Public Health, Oncology Centers (Primary Health Services and Maternal and Child Health Units), NGOs.

F. *Diagnosis and Treatment:*

- *Oncology centers still need to introduce modern technologies to diagnose and treat cancer patients.*
- *Diagnosis:*
- Cancer diagnostic facilities (endoscopy, biochemical investigations, hematology, tumor markers, imaging, diagnostic cytology, and histology) are extensively developed in some of the major cities in Yemen.
 - However, many governorates still lack some of these services. Even in existing pathology laboratories, some facilities lack some of the major diagnostic methods such as histopathology methods not found in some centers and hospitals.
 - Histopathology services need strengthening, in particular, facilities and staff training for centers required to provide immunohistochemistry (IHC), specifically for the type of breast cancer with respect to hormone receptor status, ER, PR, HER 2 , which is important in defining treatment and prognosis protocols.
 - Histopathology services are an important source of information for cancer registries, but usually, their

cancer reports lack vital information about the patient, especially place of residence. Pathologists should consider submitting a standard application form for nationwide use, requiring basic demographic data (name, age, gender, residency (province)) and clinical data and encouragement to complete them correctly.

➤ *Action steps and operational plan:*

- Establishment of an immunochemistry unit in the Department of Pathology (immunohistochemistry) and Cytogenetics at least in oncology centers in Sana'a, Aden, Hadramout and Taiz to improve diagnosis
 - Appropriate flow of samples and pathological tissues for the aforementioned
- *Responsibilities:* Ministry of Public Health, National Oncology Centers and Central Laboratories.
- Developing annual training courses to qualify doctors and technicians
 - Responsibilities: Ministry of Public Health, central laboratories and universities
 - National pathology application form that includes important demographic data
- *Responsibilities:* Pathologist, Oncology Centers, Ministry of Public Health, Central Laboratories
- *Medical Oncology:*
- Adult and pediatric oncology chemotherapy is limited to some specialties. Cancer care services.
 - Intensive chemotherapy for some curable cancers is of great importance and requires
 - highly trained doctors. Chemotherapy drugs are expensive and whose use requires the monitoring of laboratory tests and skilled nursing supervision.
 - There is a shortage of oncologists and nurses trained in clinical medicine, and coordination with universities is required to open the doors for postgraduate studies in these fields.
 - There is a government provision of the basic list of chemotherapy drugs for oncology patients, but some of the more expensive treatments must be purchased, which are targeted and biological drugs, which are required to be provided in accordance with international treatment rules and protocols.
 - There are currently 11 centers and units that provide oncology services for cancer patients, especially those coming from remote areas of the country. The plan to open new oncology units in governorates that do not have oncology care units.
- *Action steps and operational plan:*
- Short-term training courses in oncology (1-4 weeks) for 20 doctors from different governorates for the year 9-2021.
 - Long-term training in oncology (1-4 years) 10 doctors (external) per year
 - 2023-2022
 - Short-term training courses for nurses locally (1-4 weeks) for 20 nurses from different specialties

- Long-term training in nursing oncology (1-2 years) for 20 nurses (external) for the year 2022-2023
- *Radiation therapy:*
 - The National Oncology Center in Sana'a (NOC) is the only comprehensive cancer center in the country with radiotherapy facilities. Nowadays, with somewhat limited equipment, it treats patients referred from the entire country.
 - In addition to the Azal Center. This work is clearly insufficient for a country of 28 million people.
 - The facilities in the National Center will be expanded when modern treatment equipment is operational and the expedited line is introduced at the expense of the Cancer Patient Support Fund, after all attempts by the program and the World Health Organization to introduce two lines to Sanaa and Aden failed.
 - There is coordination between the Ministry and the King Salman Center to work on building a radiotherapy center in Aden to reduce the burden of traveling abroad for radiotherapy.
 - A new center is planned in Hadhramaut, with construction by Saudi Arabia and equipment and staff training from the Ministry of Energy (NATIC), in 2008-2010. And wait until 2022-2023 AD
 - A fourth center is to be established in Taiz, by donating a special hospital center, equipment and personnel training from the Ministry of Energy (NATIC) and the construction period has not been specified.
 - The fifth center is Al-Amal Hospital for Oncology in Aden is a charitable hospital. The first phase was built and there are possibilities to complete it due to the availability of liquidity and the failure of construction under the pretext of war.
 - Seiyun and Shabwa centers are linked to providing suitable lands and supporting the local authority through the support of oil institutions.
- *Action steps and operational plan:*
 - Providing a linear accelerator and brachytherapy for the Sana'a Center
 - Development of radiotherapy accessories (planning system and molding room)
 - Establishing a new treatment center in Aden, which was moved from 2008/
 - Equipping (accelerated line device) and training radiotherapy cadres (radiation therapists, physicists and radiotherapy technicians) during the period 2022-2025 for each of:
 - The National Center Oncology , Aden
 - The National Center Oncology in Hadhramaut, Al Sahel. and Al Amal Center in Taiz.
- *Responsibilities:* Ministry of Public Health, National Atomic Energy Commission, National program of cancer control..
- *Specialization*
 - Radiotherapy and chemotherapy are provided by medical staff with experience and training in oncology, although more advanced specialized training for staff remains a requirements, as is. Surgery for cancer cases, however, is provided by general surgeons, without special training in surgical oncology.
 - Experience elsewhere has shown treatment outcomes (in terms of recurrence and survival) when patients are treated in specialized units, by surgeons experienced in dealing with the cancer in question, and who treat a large number of similar cases annually. Therefore, the oncology centers must move towards appointing a specialist in oncology surgical units for the most important cancer diseases in Yemen with high quality.
 - Treatment is known to improve outcomes in some types of cancers like breast cancer (several nationwide), head and neck tumors and gynecological malignancies.
- *Treatment protocols:*
 - The treatment offered for different types of cancer depends not only on the nature and stage of the cancer, the known effectiveness of different treatments (a combination of surgery, chemotherapy and radiotherapy), but also on the availability of human, material and financial resources. Treatment protocols for largely different types of cancer in high-income countries, where the focus is on maximizing efficacy and safety, with little regard for cost. As an approach, it is not feasible in countries such as Yemen, where cost, efficacy, and absolute value availability have become important considerations.
 - Decisions regarding treatment protocols, including decisions regarding the type of patient who should be referred to oncology centers, should be made by working groups, responsible for preparing a set of treatment guidelines for oncology centers in Yemen. National guidelines/protocols for the diagnosis and treatment of major cancers can ensure standardized care. Work groups can be set within the administration
- *Action steps and operational plan:*
 - Promote the development of unified national oncology protocols for each cancer to be applied in various oncology care services according to available facilities (2021-2022).
- *Responsibilities:* The Ministry of Public Health and Population, the National Program for Cancer Control and Oncology Centers
- G. *Palliative Care and Pain Treatment Unit:*
 - Palliative care addresses the needs of all patients who require relief from their symptoms, as well as the needs of patients and their families for psychosocial care and support. When patients are in particularly advanced stages and the patients' chances of recovery are very low, or when they are near the end stage of the disease. Because of the social, spiritual, emotional, and economic implications of cancer and its treatment, palliative care service programs that address the needs of patients and

their families from the earliest stages of diagnosis can effectively improve quality of life and resilience.

- The majority of cancer patients (more than 80%) experience severe pain and other serious symptoms that require urgent relief. Reducing the suffering of patients from pain. And other painful symptoms that cannot be achieved unless palliative care is received due to the attention of cancer health services. A successful palliative care program relies on a drug policy and a rational logistical plan for distribution even within the country.[24]
- Education in pain relief and palliative care should be an essential component of the training of health care personnel who may be expected to care for cancer patients.
- In Yemen, there is currently a limited service in oncology centers to provide palliative care. The general objectives are to improve the quality of life for cancer patients and their families, and to provide palliative care services in an integrated, equitable and sustainable manner in Yemen, and the immediate objectives are
- Ensure that standards of palliative care, including pain relief, are progressively adopted in the target area by all levels of care
- Providing care mainly through home services

➤ *Action steps and operational plan*

➤ *The following specific actions are suggested:*

- Establish a unit within each cancer treatment center that will be responsible for analgesics and care, to include pain management and supportive care after hospital discharge.
- Provide appropriate training for doctors and nursing staff (abroad) for the management of these centers.
- Providing specialized training for a number of anesthesiologists in the field of pain control, to be located in the main oncology centers.
- Working with the voluntary sector to establish an association in Yemen that provides home care for terminal patients, and acts as a national training center for home palliative care
- Ensure that medicines used for pain relief, according to the WHO “step” protocol, are available to everyone who needs them. This includes developing regulations that allow easy access for patients with opioids, and a logistical plan for equitable distribution within the country.
- Inclusion of information on palliative care in professional curricula (medical and nursing.)
- Create self-help and cancer support groups. These allow patients to share their fears, pain, and concerns with others who have the same problems, and to be made aware of the services, facilities and support that should be provided to them.
- Establishment of Hot line and family psychological support units in cooperation with cancer societies and foundations .

- *Responsibilities:* Ministry of Public Health, NGOs such as NCCF, Regional Program for Drug Supply and Oncology Centers.

H. Monitoring And Surveillance:

➤ *Monitoring methods are based on:*

- Systematic measurement of health and environmental parameters, recording, data transmission, etc
- Comparison and interpretation of data to identify possible changes in the health and environmental status of the population.
- “Surveillance” can encompass the concept of “observing” a disease, change or intervention and assessing its impact. Monitoring also includes continuously adjusting performance based on results. The essential elements of a monitoring program are data collection, analysis and continuous or disseminated feedback.
- Disease surveillance plays an important role in the development and implementation of public health policy - indeed, rational planning is not possible without the means to identify key health issues, prioritize preventive and curative programs, and evaluate and analyze outcomes and know targets were achieved in the target groups and what was achieved. In terms of resources expended. Therefore, according to World Health Organization (WHO) guidelines, the role of the cancer surveillance program is to continuously provide data:
- Assessing the current level of the cancer burden and its potential evolution in the future
- Work to develop areas of scientific research and provide a basis for understanding the causes and prevention of cancer
- •Development of the area of information monitoring on the prevalence and development of risk factors,
- Monitor the impact of screening/examination, treatment, analgesics and care.
- Death statistics from the vital record accompanied by a medical certificate of cause of death, when available.
- The other major component of the cancer surveillance system is the population-based cancer registry (PBCR).
- The situation is clearly unsatisfactory in that it is still not possible to produce correct data on cancer incidence in Yemen, even from a single center (although the data for Aden Governorate are not very far from reality). Until this is achieved, the next steps - the scoring phase at diagnosis, estimating survival and rates of selected cancers (particularly breast cancer) - are unimaginable.

➤ *Action steps and operational plans:*

- Adequate and dedicated staffing of cancer registration centers should be ensured in the oncology centers and the main center. This should include, for each of them, a medical director, who is prepared to supervise the work of the registration staff as part of their duties.
- Review the current methods of data collection taking into consideration all the possibilities and sources in the population (hospitals, public and private laboratories) is required, by a consultant with appropriate experience in low income environments, and prepare a manual of

registration procedures for each of them Provide sufficient funding to allow travel to identified data sources and payments to hospital/laboratory staff identified as data collectors.

- More appropriate training for registry staff (data collection, coding, data entry and for medical supervisors (in principles of epidemiology).
- When opening new oncology centers in the governorate based on the population, records must be created (for the governorates concerned) as one of its functions.

➤ *Responsibilities:* NOC, MOPHP, NGOs, with assistance from WHO (providing consultants). Searching for potential partners in Europe or Arab countries.

I. Scientific Research:

➤ *The World Health Organization has proposed the following criteria for setting priorities in cancer research:*

- Scale of the cancer problem
- *The expected cost-effectiveness of the intervention in question.*
- Impact on equity
- possibility of finding a solution.
- The scientific quality of the proposed research
- The feasibility of the proposed research.

➤ *Ethical Acceptance*

- Miscellaneous scholarly work has been published in regional and international peer-reviewed journals related to cancer in Yemen. Research in the National Library (US) presents the Medicines Database (PubMed) and an article under the key terms “Yemen +” “cancer”. Most of the research of interest is based on clinical continuums from a variety of hospitals, departments and laboratories. There is a number of population-level research on the most common types of cancer and causative risk factors.
- There are several areas in which research is clearly indicated to aid in planning and evaluating cancer control in Yemen:
- As mentioned above, it is important to determine the true picture of cancer in Yemen, as well as important indicators such as
- Diagnosis and survival stage of common cancers
- An investigation into the nature of the pesticides used in the cultivation of qat, the level of contamination of the leaves for sale, the potential harmful effects of this and any common contaminations. Studies have been properly conducted about the potential carcinogenicity of qat, with an initial focus on oral or esophageal cancers. Case-control design, with the appropriate control group, and attention to adjusting for important confounding factors (tobacco smoking is known to be associated with qat use, for example).

➤ *Action steps and operational plan:*

- Identifying research topics that are locally relevant, in cooperation with medical schools.
- Develop research protocols with the help of reputable researchers from medical institutions around the world.

➤ *Responsibilities:* The Ministry of Public Health and Population, oncology centers and universities in cooperation with the World Health Organization / Yemen. The role of NGOs

VII. CANCER CONTROL SUPPORT FUND

A. *The Fund Aims to Find Financial Resources that are Stable and Sustainable to Achieve the Following Purposes:*

- Cancer prevention and control.
- Contribute to the establishment and support of centers, projects and programs related to cancer control in accordance with the national cancer control strategy .
- Supporting and providing medicines, supplies, devices and medical equipment necessary for diagnosing and treating cancer in government centers, health facilities, and institutions that provide all their services free of charge in accordance with the general policy of the fund, financing conditions and legal exchange rules.
- Funding programs, research and scientific studies related to the cancer control programs, according to the possibilities available to the Fund.
- Contribute to supporting training and rehabilitation programs for health personnel in the programs of cancer control.
- Contribute to the establishment of the National oncology Centers to provide an integrated service for cancer patients through..
- Providing all necessary diagnostic and therapeutic means.
- Providing nutrition, housing and medicines during the treatment period in a way that enables the health staff to complete treatment plans without interruption and ensures that the cancer patient obtains the best results according to the available capabilities of the fund.

VIII. HUMAN RESOURCES (HR):

Human resources are a key factor for the proper implementation of the program in different stages. There is still a gap between what could be and what is actually in operation.

Capacity building including training programs in various technical disciplines. Management should be established through short-term and long-term programs primarily for surgeons, oncologists, radiation oncologists, pediatric oncologists, histopathologists, hematologists, epidemiologists, cancer registry, nurses and other specialties.

Table 2: Available Human Resources at Oncology Centers

Specialty	NOC Sanaa	NOC Aden	Alamal Taiz	Shabwah	Mukalla	Sayoun
Radiation Oncologist	12	3	2	0	1	0
Medical hemato-Oncologis	3	7	2	2	4	2
Pediatric Oncology	3	3	3	0	1	0
Diagnostic Radiologist	1	2	2	1	2	2
Histopathology	1	2	1	0	1	1
G physician	10	10	5	3	5	2
Medical physics	5	1	2	0	1	0
Diagnostic radiology	2	3	1	1	1	2
Chemotherapy nurses	43	35	25	9	15	9
Laboratory technicians	20	15	8	3	8	3

Table 3: Available Equipments at Oncology Centers

Specialty	NOC Sanaa	NOC Aden	Alamal Taiz	Shabwa	Mukalla	Sayoun
Cobalt machine	1	0	0	0	0	0
Simulator	1	0	0	0	0	0
CT scan	1	1	0	0	0	1
Ultrasound	2	2	1	1	2	1
X-ray	1	0	1	1	1	1
Mamogram	1	1	1	1	0	1
Chemotherapy Cabinet	2	4	2	1	2	1
Endoscopy	0	2	0	0	0	0
Pathology Lab	1	1	1	0	0	1
Bed inpatient	90	120	60	25	40	30
Laboratory	1	1	1	1	1	1
Blood bank	0	1	0	0	0	0

IX. PROGRAM MANAGEMENT AND COORDINATION

Implementation of the NCCP - ie ensuring its progress beyond the paper document, as well as reviewing the results of the work, updating the plan, requires the establishment of an executive body charged with these responsibilities. These roles shall be the responsibility of the National Cancer Control Committee (NCCC), which is supervised by the Minister of Public Health and Population or his designee. The Committee shall have a permanent secretariat which shall be responsible to the Chairman of the Board of Directors for the agenda and supporting documents of its meetings, preparing minutes and other memos and following up on decision making with appropriate persons or organizations. The NCCC will form sub-committees and working groups , to engage all key stakeholders in the cancer control program across the country, to discuss the NCCP project, and to seek contributions from as many people as possible at its end of review and evaluation.

X. CONCLUSIONS:

The National Cancer Control Plan is a pioneering effort of the National Cancer Control Program to develop and implement a comprehensive and coordinated program in 2023-2027 AD to fight cancer in Yemen and develop infrastructure. The proposed plan sets out principles for current and future cancer control actions in line with WHO regulations. It also includes goals and priority areas for work

and research according to the available capabilities of the National Cancer Control Program at the Ministry of Health and in consultation with the societies and institutions involved in the fight against cancer.

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