

Laboratory medicine in Palestine

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ARTICLE INFO

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Key words:

Palestine, accreditation,
molecular testing, quality assurance

ABSTRACT

Background

Laboratory Medicine (LM) is one of the cornerstones of healthcare. In Palestine, 3.5% of health expenditure is allocated to clinical laboratories.

Methodology

The Palestinian Ministry of Health (MOH) started to invest in the development and expansion of laboratory services including the introduction of full automation in blood banks and histopathology, molecular testing in microbiology, and testing for autoimmune diseases and metabolic disorders. Improvements have not been limited to new tests but also included external quality assurance (EQA) and accreditation programs.

Results

Latest investments have cut the costs of purchasing tests from outside MOH by more than 3.6 million dollars during the last five years. Al-Quds University established a Center for External Quality Control in LM which was supported by the Palestinian MOH and the National Metrology Institute of Germany. This has led to a significant improvement in the performance of the affiliated laboratories. An accreditation unit was established within the MOH, yet the

number of laboratories that have been accredited with ISO-15189 are still limited but significantly increasing.

The academic institutions have been working in parallel to the MOH in improving LM in Palestine. A new academic curriculum for LM has been developed according to the quality standards of curricula-based competencies determined by the needs of the labor market and the emerging technologies.

Conclusions

Despite the invested efforts, still, the Palestinian LM suffers from shortage of human resources which are qualified in the new emerging diagnostic approaches.



BACKGROUND

The Palestinian population is approximately 4.8 million living in two geographically separate regions; the West Bank and Gaza Strip, ruled by the Palestinian Authority since 1994 [1]. The Palestinian Ministry of Health (MOH) is the primary provider of healthcare services for the Palestinian population. Other healthcare providers include non-governmental organizations (NGOs), United Nations Relief and Works Agency (UNRWA) for Palestine Refugees and Military Medical Services.

The Palestinian population is a young population, although it has been aging over the last two decades. Further, decrease in infant and maternal mortality rates indicate improvements in the healthcare system. Nevertheless, changes in morbidity and mortality patterns which have been shifting from infectious diseases to non-communicable diseases raise new challenges to the healthcare system, especially with the increasing demand for personalized and quality patient care [2].

MEDICAL LABORATORIES IN PALESTINIAN HEALTHCARE SYSTEM

Issues and challenges

The Palestinian MOH has been working on building a comprehensive strategy to address the needs of the healthcare system and LM in particular. The total health expenditure was approximately 430 million dollars in 2016, an increase of 40% since 2010. Of the total health expenditure, 3.5% is allocated for medical laboratories [2, 3]. The role of medical laboratories in medical practices has been highlighted over the last few years, and since then several investments to improve the capacity and quality of LM have taken place. The MOH increased the number of laboratories in their facilities. The statistics of 2016 showed that the number of laboratories increased to 14 medium laboratories (hospital laboratories), 188 peripheral laboratories, three histopathology laboratories and one public health central laboratory. Six-hundred and thirteen laboratory technicians have been employed in the MOH laboratories, representing 12% of the Palestinian laboratory technicians [2]. The improvements have not been limited to only the number of laboratories, but also included investments in new equipment to increase the range of tests performed within the MOH laboratories. The total number of laboratory tests performed within the laboratories of the MOH increased from 4.5 million tests in 2011 to 6.9 million in 2016 [2]. Consequently, the Palestinian MOH significantly reduced the purchased services from the neighboring countries' healthcare institutions.

Education and training

Education in medical laboratory sciences (MLS) was introduced in the West Bank and Gaza Strip in 1979. Currently, ten MLS programs exist; one diploma, three master programs, and the remainder offer bachelor degrees. These programs are

certified by the Palestinian Ministry of Education and Higher Education and by the National Accreditation and Quality Assurance Commission which is the only body responsible for accreditation and quality assurance of Palestinian educational programs.

Palestinian MLS academic curricula lack international accreditation. Moreover, the shortage of specialized faculty members in many fields of MLS in educational institutions is one of the limitations of education in Palestine, especially in the newly emerging fields. This problem is expected to grow even further as older faculty members retire in addition to the increased need for new technical skills in MLS.

The number of training facilities and supervisors is limited, and annually around 300 students require training in medical laboratories as part of their graduation requirements. This issue created a surplus in laboratory technicians whose skills are not the most optimal. Among the graduates, and according to the records of the Palestinian Medical Technology Association (PMTA), there currently is around a forty percent unemployment rate, primarily among females. Further, the majority of the graduates are bachelor degree holders.

Recently, Al-Quds University launched a joint project with prominent health institutions aiming at improving the education quality of the MLS graduates by developing a new academic curriculum according to national and international standards. The new curriculum will be developed according to the new quality standards of the curricula-based competencies determined by the labor market needs and the provision of the partner institutions. In addition, the emerging technologies in LM will be included within the curriculum which will contribute to enhancing the hands on practice of Palestinian laboratory professionals.

Molecular diagnostics in disease control

Molecular testing is becoming a crucial diagnostic tool in the setting of inherited genetic diseases, neoplastic diseases, and infectious diseases. For the last decade, morbidity and mortality patterns of the Palestinians shifted from communicable to non-communicable diseases. The leading causes of mortality during 2016 were cardiovascular diseases, cancer, cerebrovascular diseases, and diabetes which are responsible for 65.4% of all deaths among Palestinians [2].

Molecular testing has only been introduced into the Palestinian MOH medical laboratories since 2010. Molecular testing requires specialized training and skill set. Currently, ninety-four molecular tests are available at the MOH Central Public Health Laboratory which are used to diagnose viral and bacterial infectious agents. Infectious diseases and respiratory diseases are responsible for less than 10% of all deaths in the West Bank and Gaza Strip [2]. During the period between 2010 and February 2017, a total of 19403 molecular tests had been performed to diagnose seven primary causes of respiratory tract infections including influenza A and B, *Bordetella pertussis*, Adenovirus, enteroviruses, *Streptococcus pneumoniae* and Respiratory Syncytial Virus (RSV). Among these, only 39.3% of the test results were positive and had a confirmed differential diagnosis. Molecular testing of infectious diseases is an essential tool not only for accurate and timely diagnosis and treatment monitoring but also, for disease control and surveillance. Therefore, more molecular tests should be introduced to cover a wider range of infections to enhance the differential diagnosis of communicable diseases. In addition, molecular testing is crucial in the diagnosis of genetic diseases that are common among Palestinians such as thalassemia, hemophilia, inborn errors of metabolism, and cystic fibrosis, but as yet they are not introduced into the Palestinian laboratories.

Moreover, the importance of molecular testing in personalized medicine and in oncology, in particular, has been confirmed, shedding light on its value for accurate diagnosis, targeted therapy, and oncology genomic-based effective treatment. Furthermore, the use of biomarkers is the essence of individualized oncology and has already proven to result in more effective treatment protocols [4]. The use of personalized medicine assays requires a highly qualified team of molecular biologists who are almost absent in the West Bank and Gaza Strip, creating a challenge in introducing the new emerging tests into the Palestinian laboratories.

Accreditation and quality assurance

Efficiency, cost-effectiveness, and quality of healthcare are the top priorities in today's world. Accurate laboratory tests are required for the diagnosis of diseases and monitoring of treatment. Testing errors can be reduced through quality management and accreditation to ensure reliability and quality results. Over the last few years, quality improvement in medical laboratory testing received increased attention from the MOH. In 2014, the Palestinian MOH and the National Metrology Institute of Germany: Physikalisch – Technische Bundesanstalt (PTB), supported the external quality assurance program (EQAS) that was established by Al-Quds University in 1996. The center's activities include preparation of quality control (QC) samples, distribution of samples to the participating laboratories, collection of the QC samples' results, and finally analyzing the results to evaluate the performance of the affiliated laboratories [5]. Subsequently, participation in the EQAS program became mandatory in 2016, resulting in a significant increase in the number of affiliated laboratories from 148 to 435. The program testing panel currently includes the basic laboratory tests in chemistry, hematology and hemostasis. Each laboratory's performance is determined by

calculating the mean-variance index score (VIS). Findings from the EQAS program showed a significant improvement in the performance of the laboratories upon joining the program compared to their performance before joining. As regards to laboratory accreditation, up until 2016 the only laboratory that had already received the ISO 15189 accreditation was the Central Public Health Laboratory (CPHL), which is under the supervision of MOH. It is noteworthy that, recently, a few more laboratories have started working on implementing quality management systems.

Recommendations

The role of medical laboratories in healthcare has been highlighted over the past few years within the Palestinian MOH. Several improvements that facilitated accessibility and added a wide range of new tests were achieved. In addition, the importance of quality assurance and accreditation in providing quality care became well recognized. Regardless, continuous efforts are still required. In this context, there is an urgent need to work on broadening the use of molecular testing in LM for non-communicable diseases especially cancer. Moreover, personalized medicine assays should be implemented to provide the best possible cancer care in terms of treatment and prediction of prognosis of the patient. On the top of that, academic institutions should play an integral part in the continuous improvement of laboratory technicians' qualifications by updating the academic curricula to include the most recent approaches and technologies in LM. In addition, partnership and collaborations with international bodies specialized in laboratory medicine should be initiated to offer opportunities for training and capacity building of human resources which will consequently enforce the transformation process. Finally, a coherent national policy for accreditation and quality assurance should be emphasized and implemented by the Palestinian

MOH to all laboratories and for all types of tests to ensure a high quality of the provided laboratory services.

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