

History of Medical Laboratory Services in Bahrain. Part 1. The Beginning and Early Developments (1940-1963)

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In 1945, a young Indian unqualified, unskilled and inexperienced technician, Mr. Hakumudin, was employed on a monthly salary of 45 Indian Rupees, found himself in a small 14 x 12 ft room in the ground floor of Naim Hospital. This was the first recognized laboratory service in Bahrain^a. The Naim Hospital was opened in 1940 and the establishment of a laboratory service after five years was a tremendous development in recognizing the importance of this service in the diagnosis and follow up of clinical conditions.

Prior to 1945, laboratory facilities were available at the Victoria Memorial Hospital, Mason Memorial Hospital (presently the American Mission Hospital) and the Bahrain Petroleum Company Hospital (presently the Awali Hospital), which were opened in 1901, 1902 and 1937 respectively, but there are no records to ascertain this service¹⁻³.

It is logical to assume here that prior to 1945, and even before the opening of Naim Hospital in 1940, bed-side laboratory investigations must have been practiced for the diagnosis and follow up of various clinical conditions, but again there is no record to support this. These investigations, which were also done at the out-patient clinics, clinical wards, and operation theatre included routine and microscopic examination of urine (for sugar, blood, bacteria), stools (for intestinal parasites) and blood (for cell counts, sugar, malaria parasites etc.). There were a number of clinics and dispensaries opened in many areas in Bahrain in 1940 and simple investigations must have also been practiced in these centres^{1,2}.

THE EARLY YEARS (1945-1950)

Dr R.H.B Snow - the Director of the Department of Health of the Government of Bahrain- had decided to establish the laboratory services. The decision was not aspirational or visionary, but a necessity of the time and realisation of the importance of laboratory medicine in hospital clinical practice. Laboratory medicine emerged as an important diagnostic clinical tool during World War Two, and it was natural development to bring the medical services in Bahrain to that of developed services of the allied forces stationed in the Arabian Gulf.

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Organisation. In the early days, the “Laboratory” and the “X-Ray” services were under one administration and Mr Hakumudin was in charge of both. There were four untrained Bahraini “Laboratory Assistants” on a monthly salary of 30 Indian Rupees to help him^b. The working hours were from 8 AM to 2 PM daily. There were no air conditioners, and the refrigerators operated on kerosene.

In 1947, Mrs Hills a qualified British technician whose husband was the Director of the Public Works Department of the Government of Bahrain was locally employed. She took charge of the laboratory service leaving Mr Hakumudin, the founder of the laboratory in the “X-Ray Department”. She improved and introduced more tests and was assisted by Mr. Rahmat Masih, the first qualified Indian technician to work in the laboratory, who joined in the same year as Mrs Hills. Hakumudin objected on this transfer, but could not win in the face of his limited laboratory knowledge and the demands for improvement and expansion.

Laboratory Tests. The number of tests performed at the time of Mr Hakumudin and Mrs Hills was small using the limited techniques of that era. These included red cell count, total and differential leucocyte count by Neubauer Counting Chamber, haemoglobin estimation by Salhi’s method, blood film screening for malaria parasites, Khan Test (KT) for venereal diseases, Aldehyde Test for Kala Azar (visceral leishmaniasis), serum bilirubin by Levy-Bond Comparator method, blood sugar and urea by visual colorimeter, alcohol by “Burning Method”, routine and microscopic examination of urine (for sugar and blood) and stools (for intestinal parasites). The laboratory was equipped with centrifuges operated manually and the least skilled laboratory staff was given the task of spinning.

Epidemiology and Disease Pattern. The type of tests during the days of Mr. Hakumudin and Mrs Hills also reflected the prevalent diseases of that time, as well as, the social behaviour of the residents of Bahrain. The main health problems were malaria, trachoma, skin diseases, bronchitis, and tuberculosis accounting for 53% of the diseases affecting patients who attended the various health clinics². Other health problems were smallpox, malnutrition, intestinal parasitic diseases, venereal diseases, diarrhoeal diseases (cholera, typhoid, and dysentery), filariasis, especially among visitors, meningitis, pneumonia, diabetes, and chronic joint pains³⁻⁵. Most of these were related to poverty, infections, poor hygiene and sanitation. Blood sugar was tested because of the rampant complications of diabetes, especially eye diseases and chronic non-healing leg ulcers among pearl divers. Malaria was also common, especially after the winter rainy season, and screening of blood films was necessary for the diagnosis. There were a number of stagnant and un-drained water ponds in the outskirts of Manama and in the northern villages, which helped the multiplication of mosquitoes.

The pearl industry was the second most important occupation after oil industry and health problems among this group of workers included bronchitis, haemoptysis and ear diseases⁵. The latter was due to pressure changes on the tympanic membrane leading to perforation and otitis media., while, the former was probably due to pulmonary diseases

particularly tuberculosis. It was natural to assume an increase in the incidence of venereal diseases, particularly, gonorrhoeal urethritis, syphilis and non-syphilitic conditions (yaw, pinta etc.). In this context it is worth noting that until the mid 1950s, prostitution was licensed within Gebla, a district of Manama adjacent to the Naim Hospital as well as in Grandol in Muharraq. There were many sailors, traders, and visitors to Bahrain who brought venereal and other diseases with them. Gonorrhoea was screened for by Gram's Stain only and the Treponema Pallidum of syphilis were demonstrated by Dark Ground Field Microscopy. Khan's Test (KT) for syphilis was used to screen the local population, troopers stationed in the Gulf, visitors and traders from nearby countries. The location of the Naim Hospital near the port, "alfourda", the only inlet to Bahrain at that time, made it accessible to all sick traders, seamen, and patients from nearby Gulf Emirates, Yemen, and Iran seeking treatment in Bahrain. It should be noted here that between 1920-1950, venereal diseases were common in many parts of the world, and States of the Arabian Gulf, being the centre of local and international trade, were affected.

Alcohol abuse was a major problem in Bahrain during and after the events of World War Two. This was complicated by the fact that many of the abusers came from the nearby Gebla. In addition, alcohol abuse was common among the large contingent of foreign military troops stationed in the Arabian Gulf during the war.

It is not clear why Kala Azar i.e. visceral leishmaniasis was screened for when only the cutaneous form of the disease first appeared and reported in Bahrain in the 1980s⁶. However, since both forms of leishmaniasis were - and are still - rampant in all the Arabian Gulf states, particularly Iraq, it was probably a routine procedure to screening for leishmaniasis in all medical establishments in the Gulf.

It is important to note here that the estimation of serum bilirubin was among the tests carried out at the Naim Laboratory between 1945-1950, indicating that jaundice was common clinical problem at that time. Judging from the scientific knowledge available to us now, jaundice cases were most likely due to viral hepatitis associated with poor hygiene, blood-borne infection following the use of contaminated hospital needles and syringes, or sexually transmitted disease. Furthermore, the jaundice may have been a clinical manifestation of haemolytic crises associated with haemoglobinopathies, group of hereditary disorders common in Bahrain⁷.

The hospital and laboratory workers were aware of infection, sepsis, and contamination. For this reason syringes and needles used for intramuscular injections and intravenous blood collection were routinely boiled. But this did not prevent the development of post-injection abscess formation, which were common, and very difficult to treat during an era when the use of antibiotic was still under development. They were unaware, of the relationship between contaminated needles and liver viral diseases because the state of scientific knowledge had not discovered this association.

THE YEARS OF EARLY DEVELOPMENT (1950-1963)

The needs and priorities of hospital practice, and the dominant health problems in Bahrain dictated the expansions of the laboratory services between 1950-1963. It is worth to note that the Department of Health of the Government of Bahrain was established in 1952^{1,2}. At that time, there was more emphasis on infections, thus, the main development was seen in the areas of bacteriology and serology. Similarly, there was a need to refine laboratory techniques and introduce new tests. Qualified and experienced laboratory technicians capable of handling the growing increase in workload were recruited from overseas centres, and a local training programme was started to train Bahraini laboratory technicians. Although, important and clinically warranted, it was not cost effective to introduce techniques for other equally important clinical problems such as biochemical tests for the diagnosis and follow up of patients with thyroid diseases and the histological examination of surgical specimens. Therefore, it was more convenient to send these specimens to overseas centres.

Other developments, which took place between 1950-1963, were two major expansions of the laboratory premises and the accompanying steps for this were a number and the administrative, technical, and budgetary planning and preparations for these expansions. There was also the evolution and organisation of the laboratory practice into specialities, and the laying foundation for new ones such as clinical toxicology.

Two Expansions and Two Hospitals. With the increased workload, the laboratory was shifted in 1950 to newly built premises on the third floor of Naim Hospital above the operation theatre. This was another recognition of the role of the laboratory in clinical diagnosis and follow up of patients. During the following years, the Department of Health had to deal with expansion of the medical services as a whole. The Naim Hospital was overcrowded with limited bed capacity, and building new wards at the same complex was not practical. In particular, there was a need to expand the maternity and paediatric wards.

The Naim Hospital was for male patients only, and “women quarter” was in need. The social and cultural tradition at that time favoured the separation of women from men. Accordingly, Women Hospital like Naim Hospital for Men was community requirement. Therefore, to build another hospital would require its support services such as the laboratory, x-ray, physiotherapy, pharmacy, catering, etc.

In 1960, the main laboratory was transferred to a spacious, purposely built and well-equipped premises of the newly constructed Salmaniya Women Hospital (located at the Salmaniya district of Manama, about a kilometer from Naim), which was opened in 1958, leaving a small unit at the Naim Hospital to deal with the routine work.

Organisation

In addition, to the endemic infectious diseases, there was growing problem of hospital-related infections. During the 1950s, there were increasing numbers of cases of abscesses

following hospital intramuscular injections with contaminated needles and syringes, which was an embarrassment to the health authorities. The decision to solve this problem was an administrative measure, rather than, enforcement of infection control measures. Accordingly, Dr Snow, while considering hospital infections as priority transferred Mr D. John in 1955, a male nurse-cum-technician from the Nursing Section to the Laboratory to help Mrs Hills, and to start bacteriology service necessary for the identification of bacterial organisms responsible for the infections. In 1956, Mrs Hills left the laboratory and Mrs Thompson, an experienced bacteriology technician, took charge as the Laboratory Superintendent. Together with Mr D. John, Mrs Thompson developed the bacteriology and introduced serological techniques. In 1961, Thompson left Bahrain and was replaced by Mr Jenkins, a British technician. He continued on the path to provide routine laboratory investigations. In 1963, Mr Jenkins left Bahrain and was replaced by Mr. Whitely, also British.

During the period between 1950-1963, many Bahraini trainees joined the laboratory service, some of whom, were transferred from other medical services^c. Qualified Indian and Pakistani technicians also joined the laboratory^d.

Bacteriology and Serology Tests

Most of the tests introduced in Bahrain between 1950-1963 were related to bacteriology and serology reflecting the prevalence of microbial infections as a common clinical problem in the country. Bacteriology tests provided direct identification of micro-organisms, whereas, serological investigations provided an indirect evidence of a disease process caused by an organism that cannot be demonstrated in routine clinical laboratories except in academic and research centres. The driving forces behind the development of bacteriology and serology tests between 1955-1956 were Mr D. John and Mrs Thompson.

Before 1955, the bacteriology tests done at the laboratory were routine and microscopic examination of urine and stools, Gram stain for identification of vast array of bacterial infections and Ziel Neilson's (ZN) stain for the demonstration of Acid Fast Bacilli (AFB) such as Tubercle bacilli in the sputum of patients suspected with pulmonary tuberculosis.

John used his clinical knowledge as a male nurse, and applied it to laboratory practice. He was aware of many clinical conditions, common causes of infections, proper methods of sample collection, and accordingly, introduced bacterial culture. This was the first milestone of bacteriology service in Bahrain, providing proper identification of bacteria with scientific taxonomy during a period when the potential use of antibiotics in the treatment of infection was still under worldwide exploration. There were very few antibacterial drugs available on the market. The most famous of these was a powder locally named "the MB Powder", a sulphonamide manufactured by Mayor & Baker Company - thus the MB abbreviation. The powder was miraculous in curing all infections particularly suppuration caused by *Staphylococcus* sp.

Since 1940s until 1956, serological tests were mainly aimed at the diagnosis of venereal

diseases, with the exception of Aldehyde Tests for diagnosis of Kala Azar. This was an indication of the importance and the frequency of venereal lesions encountered in the clinical practice in Bahrain. In addition to Khan's Test (KT) introduced since the late 1940s, Wassermann's Test (WT), another "more sensitive method" was introduced in the 1950s. The technique for WT required the addition of sheep blood and Mr Ali Abdulla Hilal, a Bahraini technician, was assigned to collect the required quantities from the nearby local slaughterhouse. Furthermore, an "advanced" serological test, Reiter Protein Complement Test was also introduced in 1950s (now outdated and replaced by more specific tests).

In 1956, Mrs Thompson introduced Widal test, a serological investigation for the diagnosis of Salmonella spp. infection, indicating that outbreaks of typhoid disease were frequent. This was related to the poor standard of hygiene at that time, non-availability of clean drinking water and no proper sewage disposal system.

Other Laboratory Tests

The new technicians recruited in 1950s replaced the old laboratory methods with new techniques. Thus, the photoelectric colorimetric method replaced the Salhi's method for the estimation of haemoglobin and the Levy-Bond Comparator for serum bilirubin and visual colometry for blood sugar and urea. Semen analysis was introduced at that time.

Surgical Pathology - A millstone in Overseas Referral Tests

During the 1950s, many specialist surgeons were employed by the Health Department of the Government of Bahrain to deal with the expanding health services. These required a histopathological diagnosis on the removed operative specimens to help plan the treatment and follow up of their patients. Although the laboratory manual techniques for the processing of these surgical samples was well established at that time and could have been done in Bahrain, there was no one with sufficient knowledge in surgical pathology to examine the samples, and select representative tissues for the histopathology processing, and then, report on the histological section. The health authorities may have considered employing a pathologist, but they found such a step is unjustified in view of the small number of specimens in question. There were also priorities other than the surgical samples. Accordingly, it was decided to mail the entire formalin fixed surgical specimens to Christian Medical College, Vellore, South India. This was a millstone in the histopathology services in Bahrain. At Vellore, the gross description of the specimens was done by qualified and experienced pathologists, and representative tissue was taken and processed into paraffin blocks, cut into microscopic sections and stained for histopathological examination and reporting. It should be noted here that operative samples from the American Mission Hospital were sent to Vellore long before the decision of Mrs Thompson to send the Naim Hospital sample to the same centre.

Sending the surgical samples to India involved a lengthy waiting for the air-mailed diagnostic report to arrive in Bahrain, sometimes, taking several months resulting in delays of serious clinical decisions. Occasionally telegrams were exchanged, but these

were also costly. Furthermore, many of the surgical specimens were biopsy materials taken from seriously ill patients with urgent request for histological diagnosis. It was unacceptable to keep these patients waiting for one month or more. On the other hand, very often the specimens were received at Vellore decomposed and unsuitable for processing, thus, requiring the surgeons in Bahrain to take another biopsy, again experiencing further delays in patients care. Because of these technical problems, the surgical team in Bahrain decided in 1960 to interfere by selecting their own tissue samples, and let their own local laboratory process them into a paraffin blocks. These blocks were sent to India for cutting, staining and reporting. Even with this new practice, the delay in receiving the diagnostic report remained unchanged.

Thyroid Diseases - Another Reason for Overseas Referrals

Thyroid diseases were recognised in the 1950s as a notable health problem in Bahrain. Goitre and thyroid cancer were frequently diagnosed, and there was a need to investigate patients with thyroid disease. The laboratory investigations of these patients were costly and involved complicated methodology, only very few centres in the world could afford. At that time, Protein Bound Iodine (PBI) was considered as one of the highly accurate and sensitive measures of thyroid function - now defunct, outdated and inaccurate. It was conceivable that PBI could not be introduced in Bahrain because of the cost and preparation required, not to mention there were other priorities, which the health authorities wanted to address first. Again, Mrs Thompson and her laboratory group were forthcoming in re-arranging their priorities of spending and establishing that blood samples taken from thyroid patients must also be sent, like the surgical specimens, to a specialised centres. The Indian laboratories were probably still behind the European centres, and accordingly, blood samples were flown weekly via the BOAC (British Overseas Airways Corporation) to London for the purpose of PBI estimation. This was another millstone in the laboratory practice to establish a European laboratory as international reference centre.

Training of Laboratory Technicians

Mrs Thompson also started three years in-service training program for her laboratory workers, giving them organised and scheduled lectures on anatomy, physiology, bacteriology, blood groups, haematology, and biochemistry. Dr Snow approved the program, and as a result, those who successfully completed it were promoted from “Laboratory Assistants” to “Laboratory Technicians”. Ali Abdulla Hilal, was one of the pioneer graduates, and accordingly, his salary was raised from Indian Rupees 30 in 1947 to Rs 150 in 1956, a remarkable increase of 500% in 10 years^a.

The Nucleus of Forensic Toxicology Laboratory

When Mr Jenkins joined the laboratory in 1961, there was an upsurge in the incidence of alcohol and narcotic related problems in Bahrain. This prompted the authorities to enforce the law and made alcohol consumption punishable by six months imprisonment. As a result, the medical practitioners examined all alcohol abusers brought to their

attention, and routinely sent blood samples to the laboratory to screen for alcohol content. Furthermore, there were constant requests from the police authorities for laboratory report on “confiscated matters”, mostly alcoholic beverages and opium, to be brought as evidence in the courts. The police did not have their own laboratory, and it was common practice at that time to bring all such matters to the largest laboratory in Bahrain - the Salmaniya laboratory.

Accordingly, Jenkins established a bench space for police work, thus, laying the foundation for forensic toxicology laboratory services in Bahrain. He created a special laboratory for the analysis of alcohol and spirits, opium, marijuana, hashish, and watany, a locally brewed spirit. A spectrophotometer was used in the laboratory, and a Filter paper was used for the detection of opium.

The Emergence of Laboratory Specialties

The shifting of the laboratory from Naim to Salmaniya in 1960, was accompanied by the organisation of the laboratory into four main specialties; Haematology, Biochemistry, Bacteriology and Blood Bank Serology, each of which occupied an independent bench space. There was no Histopathology service. This re-organisation was an evolution in response to the needs of clinical practice in Bahrain at that time, and was not influenced by the education and training of doctors working at the two Government Hospitals. The teaching of these specialties at the medical schools at that time was in the form of academic subjects with no clinical application. But in hospital practice, the application required the skills of clinicopathological interpretation. Furthermore, parasitology was also taught as an academic subject, but in hospital practice it was included under “Microbiology”.

However, on the administrative level the laboratory remained under one “organisation” but on the operational level, each technical staff was assigned to one “laboratory speciality”, thus, establishing boundaries, framework, and function of these specialities. Occasionally, some senior experienced laboratory technicians were assigned more than one technical (ie. speciality) duty, such as, handling tests requested by the Accident and Emergency Department and clinical wards, but still remaining under the organisation of their principal unit.

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Endnotes

The first date after the name of the persons listed below was the date of joining the government service. Additional information such as current status and last post held also given.

- a. A specially issued Gulf Rupee of the Government of India was used throughout the Arabian Gulf until 1965 when it was replaced by the Bahraini Dinar.
- b. Mr Jaffer Maki (1945), Mr Ali Abdulla Hilal (01.04.47, retired on 01.12.87), Mr Ibrahim Abdulemam (1945, retired in December 1997) and Mr Saied Hassan Rahma (1945).
- c. Mr Ibrahim Hassan Al Jeeb (April 1948), Mr Abdulla Hassan Al Qubaisi (February 1955), Mr Sayed Abdulla Mohammed Hassan (August 1956), Mr S. Mustafa (June 1959), Mr Ali Abdul Rahman Mudafari (01.09.60, retired 31.12.88), Mr Sayed Abdulla Sayed Ibrahim (1959).
- d. Mr Harib Hassan was the first Arab from Oman to join the laboratory service in Bahrain on August 1956. Other non-Bahraini technicians were Mrs Gracy (1956), Mr Jacob (1956), Mr A. Simon (03.11.56, retired 28.02.87), Mr Thomas M. Perincheril (11.12.56), Mr Kureshi Iqbal (April 1961), Mr Jacob, Mrs Susan George (1963), Miss Mary Isaac (1963), Mr Mathai (1963), and Mr. Mohammed Hussain (1963).