An Evaluation of Quality Aspects of Primary Health Centre (PHCs) Laboratory Using National Quality Assurance Standards (NQAS) Tool in Hassan District, Karnataka

Nirath S. Hegde[1], M. Sundar[2], Maliakel Steffi Francis[3], Mahesha K.C.[4]

[1]Junior Doctor, [2]Professor and Head, [3]Post Graduate, [4]Junior doctor, Department of Community Medicine, Hassan Institute of Medical Sciences, Hassan, Karnataka

Abstract

The Primary Health Centre (PHC) is the nearest point of contact that should be accessible to the public for availing health care services. The ability of a PHC to provide quality healthcare is determined by the laboratory support along with the infrastructure attached to them.

Objectives: To determine various shortcomings in the PHCs laboratory services utilizing National Quality Assurance Standards (NQAS) tool.

Method: For the same, National Quality Assurance Standards (NQAS) tool is used in this study. 24 PHCs laboratory (from 134) in Hassan district were selected from 8 taluk as which formed a study population. Various quality factors among 7 domains were subjected to reliability testing and principal component analysis (PCA).

Results: The dengue serology was not done in more than 45% of laboratories. Referral pattern was inadequate in more than 90%. Only 37.5% followed SOPs. With reference to testing procedure and charts for biological reference range (0.723) and reporting of tests within given duration was (0.677). Kaiser-Meyer-Olkin measure of sampling adequacy value was 0.417 ($P<0.001$.). Also, for support service component, three factors yields Cronbach's alpha=0.712

Conclusion: Recruitment of qualified laboratory technician and training them to quality work is very important. Not only that, financial input with maintenance of equipment and work ethics towards quality in diagnostics is imperative for case management in primary health care.

Keywords: *PHCs,laboratory services, principal component analysis, Quality standards.*

Introduction

The Primary Health Centres (PHC)are the cornerstone of rural health services and it should be as nearer as possible and accessible to public in Indian public health system. These centers are established to provide comprehensive health care including preventive, promotive, curative and other health care services.[1] Under National Rural Health Mission (NRHM), the highest priority was given not only for providing quality health care by Introducing Indian Public Health Standards (IPHS), but also it must be sensitive to the needs of the community.[2]

Laboratory facilities are essential component of PHCs and they are often accessed more than the PHC could carter for their design.[3,4] The ability of a PHC to provide quality healthcare is determined by the

Corresponding Author:
Dr. M. Sundar
Professor and HOD, Department of Community Medicine, Hassan Institute of Medical Sciences, Hassan, Karnataka-573201
e-mail: msundar34@gmail.com

laboratory support along with the infrastructure attached to them.[5] In areas where sufficient physicians and drugs are available, developing laboratory facilities have become a priority.[2]

In this regard, National Quality Assurance Standards (NQAS) takes note of all these areas, thereby providing a department wise score card with areas of improvement.[6] NQAS is a comprehensive and evidence based tool with specific objectives. The areas covered ranging from service provision to quality management and outcomes that received high priorities under the same.[6]

Objectives: This study was taken up to determine various shortcomings in the PHCs laboratory service sutilizing National Quality Assurance Standards (NQAS) tool.

Materials and Method

Study design: A Cross-sectional study done among laboratories of primary health center after obtaining Institutional Ethics committee approval regarding quality related variables such as service provision, patient rights, inputs, support services, clinical services, infection control and quality management.[6]

Study procedure and Data collection: Hassan district (Karnataka) has 8 taluks. Out of 134 PHCs in Hassan district, two to three PHCs were selected in each taluk based on the inclusion criteria. 24PHCs were considered as our study population. These PHCs were personally visited by investigators to assess their laboratory inputs and infrastructure based on NQAS tool. Thus data obtained from 24 PHCs laboratories were analyzed using SPSS software 22 version.

PHCs covering maximum populations in each taluk, with fully established laboratories that are functional for more than 2 years, were included in the study. PHCs which did not have a Medical officer posted during the study period were excluded from the study. Scoring under NQAS:0-no availability of services,

1 Availability of services with poor maintenance and utility

2. Availabilty of services with proper maintenance and utility.

Findings:

Table 1: Various Factors of Service Provision, Input and Support Service and Clinical Services in PHCs (n=24)

Factors	0a	1	2
PATHO-urine routine & RBS	2(8.3)	5(20.8)	17(70.8)
Hematology	0	15(62.5)	9(37.5)
Rapid serology	0	13(54.2)	11(45.8)
Emergency (24*7) lab services	19(79.2)	1(4.2)	4(16.7)
Microscopy -MP, sputum	2(8.3)	16(66.7)	6(25)
Water quality tests (orthotoludine, H2S)	0	15(62.5)	9(37.5)
One lab technician	2(8.3)	4(16.7)	18(75)
Training of lab technician for usage of equipment's	3(12.5)	4(16.7)	17(70.8)
Microscope	3(12.5)	2(8.3)	19(79.2)
Sahli's heamoglobino meter	3(12.5)	3(12.5)	18(75)
Equipment breakdown maintenance	10(41.7)	10(41.7)	4(16.7)
Calibration of equipment's	10(41.7)	10(41.7)	4(16.7)
Referralcenter & form	6(25)	16(66.7)	2(8.3)
Charts for biological reference range	10(41.7)	13(54.2)	1(4.2)
Charts for testing procedure	11(45.8)	13(54.2)	0
Retaining of reports & their prompt retrieval	1(4.2)	17(70.8)	6(25.0)
Reporting of tests within given duration	1(4.2)	5(20.8)	18(75.0)

Note: NQAS scoring[a]: (0 = no availability of services, 1 = availability of services with poor maintenance and utility, 2 = availability of services with proper maintenance and utility.

Around 70.8 percent of the total laboratories provide services at Out Patient Department (OPD) timings, but the remaining 29.2 percent of laboratories are depending on other peripheral centers or higher centers for required services. 75 percent of the laboratories had full time lab technicians. Out of these, 70.8 percent were fully trained to operate the equipment's at their respective laboratories. Only 13 of the 24 laboratories had allotted adequate lab space according to the guidelines. 20.8 percent of the laboratories lacked a fully functional and well-maintained microscope. Support services for equipment breakdown maintenance was done in 16.7 percent. The same number of laboratories also carried out calibration of these equipment's as per guidelines. More than 67 percent of laboratories did not provide sample IDs for the samples collected for testing at the laboratories. Referral forms were not used in 91.7 percent of the laboratories and requisition and reporting forms were not used in 87.5. 87 percent labs did not properly instruct ASHA and ANMs for sample collection. Charts for biological range of a given test for reporting the result was absent in almost all the labs. 75% of them provided reports promptly within the given duration of time.

Table 2 Procedures done in PHC's for infection control and specific quality management factors (n=24)

Different procedures	0	1	2
Antiseptic soap availability	2(8.3)	9(37.5)	13(54.2)
Display of Hand washing technique	5(20.8)	4(16.7)	15(62.5)
Availability of running tap water	3(12.5)	14(58.3)	7(29.2)
Proper cleaning of procedure site with antiseptics	2(8.3)	19(79.2)	3(12.5)
Availability of lab aprons, gloves, masks	14(58.3)	8(33.3)	2(8.3)
No reuse of disposable gloves, masks	16(66.7)	2(8.3)	6(25.0)
Proper decontamination & cleaning of instruments	2(8.3)	19(79.2)	3(12.5)
Training of staff for spill management	3(12.5)	20(83.3)	1(4.2)
Proper disposal by use of color coded plastic bags, segregation	0	11(45.8)	13(54.2)
Disposal of needles	1(4.2)	8(33.3)	15(62.5)
Internal assessment at periodic interval, corrective measures taken	5(20.8)	14(58.3)	5(20.8)
Cross validation of lab tests	5(20.8)	19(79.2)	0
Assessment visit by district quality assurance unit at periodic interval	11(45.8)	13(54.2)	0
Availability of standard operative procedures	10(41.7)	5(20.8)	9(37.5)
Staff aware of SOP	3(12.5)	12(50.0)	9(37.5)

For infection control, only 54.2 percent used antiseptic soaps for hand wash. Around 29.2 percent had running tap water. Out of 24 PHCs Laboratory, 62.5 percent of the laboratories had displayed hand washing technique. 87.5 percent of labs did not follow cleaning of procedure sites with antiseptics and proper decontamination and cleaning of instruments after every procedure. Aprons, gloves and masks were not used in 22 of 24 labs studied. Complete training of staff on spill management has not yet been conducted. 54.2 percent laboratories segregated and disposed waste in color coded plastic bags, while 62.5 percent disposed used needles properly.

Only 37.5 percent laboratories were aware that they had standard operative procedures and to be followed. Only 8.3 percent of them had maintained the confidentiality of the report they provided and all the labs were providing services at free of cost for all Below Poverty Line (BPL) card holders.

The 24 PHCs laboratory data were analyzed. The different domains of National quality assurance standards such as service provision (9 factors), patient rights (3 factors), laboratory inputs (9 factors), support services (3 factors), clinical services (8 factors), infection control (10 factors) and quality management (5 factors)

were considered as independent variables. To estimate internal consistency reliability among various factors of composite score and also as an indicator of consistency- Cronbach's alpha parameter statistic was preferred. After subjecting first domain or constructs-service provision to check reliability- for 9 items (factors), Cronbach's alpha was 0.854 with mean score for availability of laboratory tests for STDs and essential tests for ante natal care as 1.83 (SD 0.38) and emergency (24x7) laboratory services mean 0.38 (SD 0.770) consisting of nine items under input in laboratories, Cronbach's alpha was 0.901. Similarly, with reference to infection control ten items domain, reliability was 0.70 among various factors.

Further, since there were too many factors in data set, we attempted by Principal Component Analysis (PCA)on the 47 items (factors) and also to overcome collinearity problems among predictor variables to reduce them down to a subset of influential factors among independent variables. To start with, we selected oblique rotation method of PCA and found many factors were uncorrelated and changed over to varimax rotation. Also, we kept Eigenvalue greater than 1 throughout our analysis.

When clinical service components were subjected to factor analysis, mean and standard deviation values for components such as reporting of tests within given duration (1.71,0.550). correlation matrix showed none of the factors in the range of -0.8 to + 0.8, but chart for testing procedure and charts for biological reference range (0.723) and referral center and reporting of tests within given duration was (0.677). Kaiser-Meyer-Olkin measure of sampling adequacy value was 0.417 (P<0.001.). Total variance to the extent of 77.65% in clinical services components were shared by 3 factors such as standards maintained for requisition and reporting, referral center and details with their forms and samples identification particulars etc. Another important domain under NQAS based collected data was infection control in laboratories. Through factor analysis, 10 components were considered and showed mean value more than 1.4 for 4 factors. In comparison, correlation matrix between antiseptic soap availability and proper disposal by use color coded plastic (0.784). In addition, disposal of needles, display of hand-washing technique, availability of running tap water, availability of laboratory aprons, gloves and mask, proper cleaning procedure, no reuse of disposable gloves and masks etc. and training of staff for spill management showed more than 0.55 correlation. KMO value is 0.56 and P<0.001. Around 74.52% total variance between factors were explained by 3 factors alone. In contrast, quality management domain consisting of 5 factors, high correlation between cross validation of laboratory tests and internal assessment, assessment visit by district quality assurance unit at periodic interval and staff aware of standard operating procedure ranging from 0.79 to 0.86. Bartlett's test of sphericity chi-square value was 72.95 (P<0.001); total variance of 83.97% was explained by two factors alone. Rotation component matrix revealed high factor loading of two constructs consisting of availability of SOPs and staff awareness and internal quality check and cross-validation.

Scree plot: To decide whether or not an eigenvalue is large enough to represent a meaningful factor, the scree plot graph was plotted of eigenvalue on (Y-axis) against the factor with which it is associated (X-axis). This graph has a very characteristic shape with a sharp descent followed by a tailing off. The cut-off points for selecting factors is at the point of inflexion of the curve where the slope of the line changes dramatically. In figure 1. about clinical services, the point of inflexion occurs at the third data point (factors), therefore, we would extract two factors. Thus, retain only factors to the left of the point of inflexion. also, it is recommended to retain all factors with eigenvalues greater than 1 which represent the amount of variation explained by a factor. Similarly, in figure 2. about infection control, the point of inflexion was noticed at the third data point and in figure 3. Representing quality management- the point of inflexion occurs at second point.

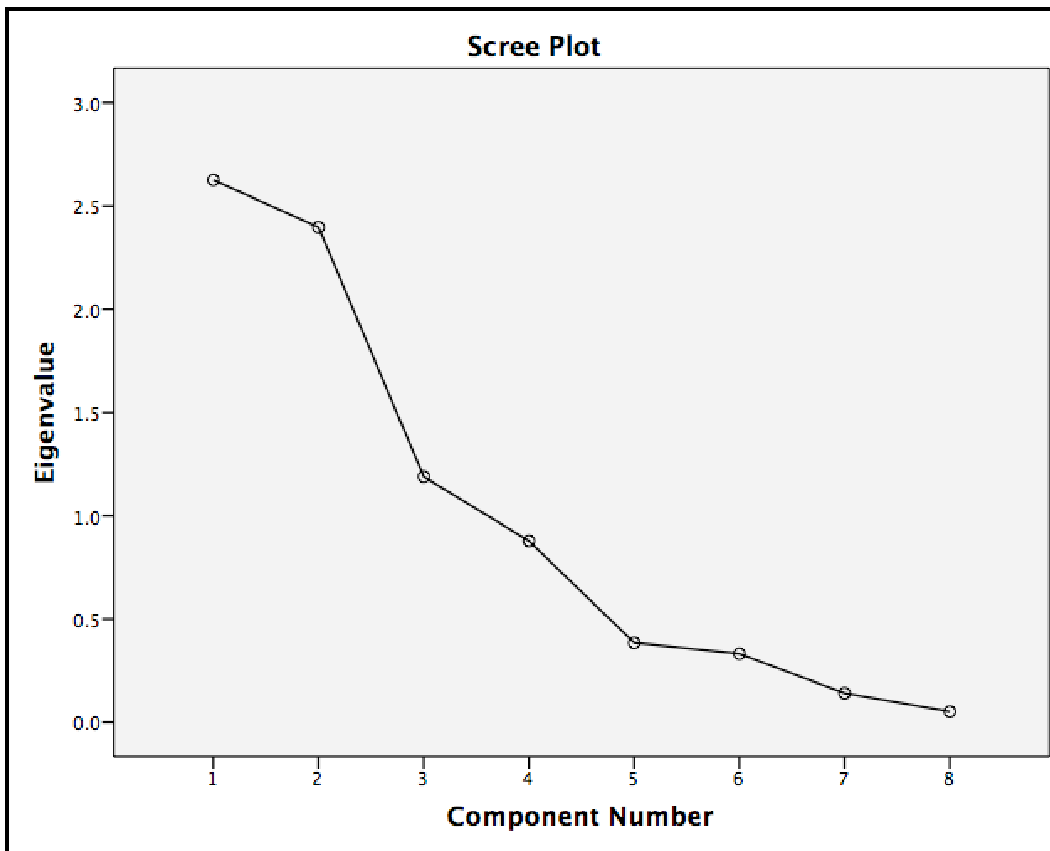

Figure 1: Clinical Services

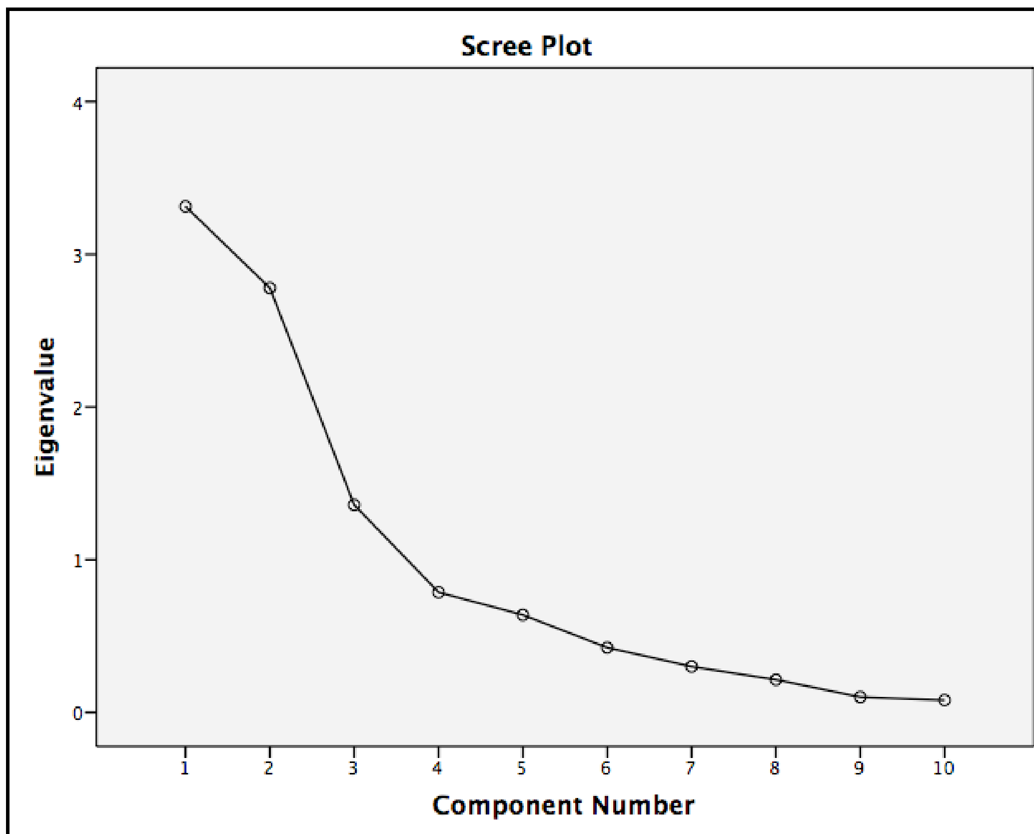

Figure 2: Infection Control

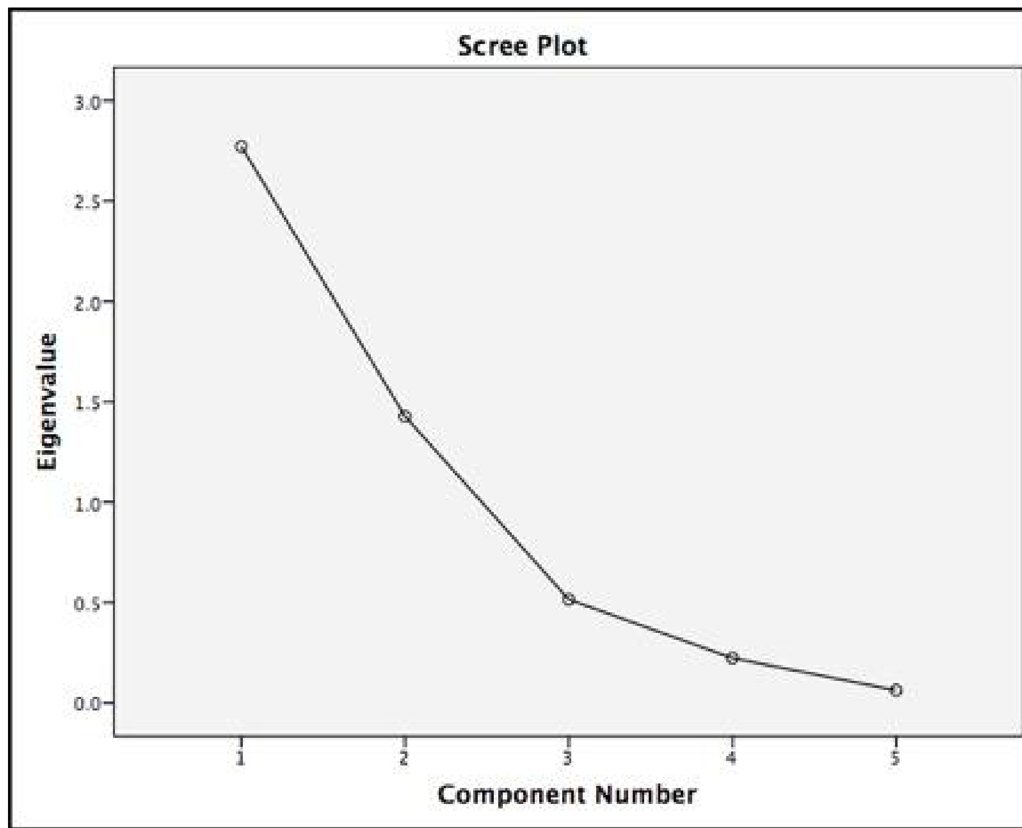

Figure 3: Quality Management

Discussion

The ministry of health and family welfare (MOHFW) has prepared a comprehensive system of the quality assurance which can be operationalized through the existing public health institutions up to primary health center level. This quality assessment tool is utilized by 18 different departments including laboratory services. Meanwhile, assessment of the quality at public health facilities is based on general principles of integrity, confidentiality, objectivity and replicability. For our study, we chosen laboratory services (department) among others for obvious reasons that there is a paucity of information for quality aspects of PHCs laboratory services although different types of services provided by these diagnostics set up. Mainly to look at quality attributes, study was conducted in 24 PHCs laboratory in Hassan district of Karnataka. Through our data analysis, around 30percent of laboratories were depending on higher centers for referral and diagnosis. Not more than 50 % laboratories were doing serology test for dengue fever cases along with malfunctioning of microscopes due to poor supportive infrastructure in majority (around 75%) of centers. Similar deficiencies were found in George M study [2,7].In contrast, comparing to Jain and Rao study[7], our study revealed that more than 75% laboratory technicians were working in PHCs. Also, these laboratories had hemoglobinometer and glucometer for daily routine usage.

Not more than 30 % of laboratory had running tap water. Surprisingly in majority of PHCs, staff including in labs were not using protective devices. But around 50% of hospital waste segregation practice was seen. In Idris and Bayoumi study[8], personnel protection devices were used in 36.4% such as laboratory coat, 6 (18.2%) personnel used gloves with every procedure and 25 (75.8%) washed their hands regularly with antiseptics. 63% of PHCs laboratory removed infectious material regularly to avoid infection. But in our study, only two laboratories used aprons and other protective clothing's etc. More than 60% in our study didn't had hand washing instructions displayed. Also spill management technique was not taught to majority of lab technicians and others in PHCs. In Hassan and Khan [9], Zaman and Laskar[10] study, glucometer were available and basic test for malaria and

tuberculosis were done in more than 50% of PHCs[7,9,10]. Whereas in Devane and Deshpande study, it was less than 50%.[5] In Idris and bayoumi study, around 15% had spill management SOPs in their labs. In our study, only 37.5 percent laboratories were aware that they had standard operative procedures and to be followed. More than 80 percent of laboratories did not carry out internal assessment for quality management at periodic intervals nor did they carry out corrective measures adequately. As mentioned in results section, through factor analyses, we attempt to understand correlation between various factors involved in quality aspects of PHCs laboratory and its intricacies in routine functioning and able to understand by building constructs of quality factors.

Conclusion: As comprehended through our study, recruitment of laboratory technician is imperative and training them to the purpose is all the more important. Adequate financial input with sufficient resources is the prime necessity to address quality aspects of PHCs laboratory. For sustainability of services, maintenance of equipment with continuum of work etiquette and periodic quality assessment by concerned medical staff should be the top priority.

Conflict of Interest: No conflicts of interest.

Source of Funding: No funding sources.

Ethical Clearance: The study was approved by the Institutional Ethics Committee of Hassan Institute of Medical Sciences, Hassan, Karnataka in the year 2019.

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