THE INTERNATIONAL JOURNAL OF SCIENCE & TECHNOLEDGE

Laboratory Profile with Infrastructural Facilities Available in Pathological Centres of Hooghly and Burdwan District of West Bengal: A Comparative Analysis between Government and Private Run Laboratories

Baladev Das
Course Coordinator, B.Sc. MLT & DMLT Courses, Sevayatan School of Medical Technology
(West Bengal University of Health Sciences and State Medical Faculty of West Bengal), Singur, West Bengal, India
Guest Faculty Member, Department of Bio-Medical Laboratory Science & Management,
Vidyasagar University, Midnapore, West Bengal, India
Kausik Chatterjee
Department of Bio-Medical Laboratory Science & Management, Vidyasagar University, Midnapore, West Bengal, India
Guest Faculty Member, Sevayatan School of Medical Technology West Bengal, India
Kazi Monjur Ali
Department of Bio-Medical Laboratory Science & Management, Vidyasagar University, Midnapore, West Bengal, India
Guest Faculty Member, Sevayatan School of Medical Technology, West Bengal, India
Debidas Ghosh
Professor, Department of Bio-Medical Laboratory Science & Management, Vidyasagar University, Midnapore, West Bengal, India
Raja Ray
Professor, Department of Microbiology, Institute of Post Graduate Medical Education & Research, Kolkata, West Bengal, India

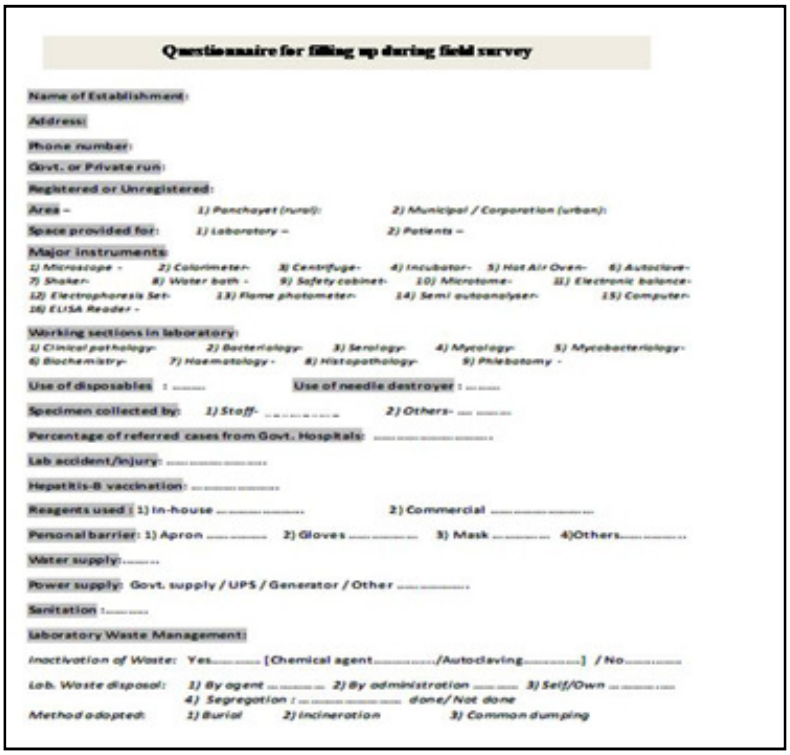
Abstract:
Modern medical therapy is dependent on diagnostic reports. To meet up the need there is mushrooming of clinical laboratories in private sector. A huge amount of money is being rolled and a large number of trained skilled and untrained staffs are being involved in this profession. Several studies have been carried out in developed and developing countries regarding laboratory profile with infrastructural facilities available in pathological centres. In our country, particularly in West Bengal about the systematic study in this concern i.e. availability of laboratory facilities, health hazards and bio-safety of the staff and technique of disposal of laboratory wastes in government and private run laboratories is scanty. In this respect, a cross sectional study was conducted during the period of 2007 to 2012 after getting ethical clearance certificate issued by 'Institutional Ethics Committee' to explore the scenario of medical laboratories in the district of 'Hooghly' and 'Burdwan' of West Bengal, India. The study covered 50% clinical laboratories (both government and private) situated within 5 kilometer radius surrounding the district/sub-divisional/rural hospitals of 'Hooghly' and 'Burdwan' districts. In the study 100 laboratories from four subdivisions of 'Hooghly' district out of which 85 from private sector and 15 from government sector were covered and from six subdivisions of 'Burdwan' district, 100 private laboratories and 20 government laboratories were covered. Laboratory profile were assessed from the view point of area, category, ownership, registration status, laboratory waste management, bio-safety and sanitation status, instrumentation, laboratory accident/injury, immunization against 'Hepatitis-B' virus, power and water resource. A pre-standardized questionnaire was used as a data collecting tool. It was evident from this experiment that the diagnostic laboratory facilities are available more in urban area than in rural area in two districts. The number of such service provider is higher in private sector than in government sector. As per financial capability of the owners of the laboratories in private sector the establishments are equipped. If there was provision of financial assistance from the controlling authority (i.e. Dept. of Health of the State or National Government) to the laboratories for infrastructural development, more services could be provided with moderate fees to the patients. Rushes of patients in the government laboratories will be automatically diminished and at the same time they will serve with a reproducible laboratory reports to the medical practitioners in time. In the government sector the increase of laboratory diagnostic services is also notable with expansion of new divisions and incorporation of modern technologies to cope up with the need based patients' services and the 'Consumer Protection Rules'. Regarding immunization status of laboratory staff, bio-safety and biomedical waste management of the private sector laboratories the costs of the vaccines as well as fees charged by the agencies become a burden for the small size private laboratories. The district health authorities may think for alternative or subsidized rate for bio medical waste management for the small laboratories along with monitoring of proper health status of working laboratory staff and laboratory profile.

Keywords: *Clinical laboratory profile, pathological centres, government and private run laboratories, laboratory staff, bio-safety, biomedical waste management, Hooghly and Burdwan districts*

1. Introduction

Laboratories are the backbone of the entire public health surveillance system. Correct laboratory diagnosis is essential for treatment and data collection of many diseases (Malone et al., 2004). In developing countries, there is an increasing need for the improvement of individual laboratories, as well as a building and reshaping of entire laboratory networks (NIC, 2008). In the era of need based diagnostic services for the treatment and management of ailing population there is mushrooming of pathological laboratories in West Bengal (Mustafa et al., 2008). How far the establishments are providing quality laboratory services that were evaluated in two neighboring districts namely 'Hooghly' and 'Burdwan' of West Bengal state, India. Laboratory facilities with infrastructure and management system were being evaluated in the study to - a) Find out the actual scenario of laboratory equipments used in the diagnostic services at each level of the laboratory network out of the selected district level b) Search out preventive measures taken in respect of controlling the laboratory acquired infections c) Observe the biomedical laboratory waste management system in comparative aspect between the government and private sector in two districts d) Develop a guidance to standardize laboratory networks and e) Focus the deficit existing in the administration and laboratory services, if any, in two districts.

2. Materials and Methods



Questionnaire for filling up during field survey

Name of Establishment:

Address:

Phone number:

Govt. or Private run:

Registered or Unregistered:

Area – *1) Panchayet (rural):* *2) Municipal / Corporation (urban):*

Space provided for: *1) Laboratory –* *2) Patients –*

Major instruments:

1) Microscope - 2) Colorimeter- 3) Centrifuge- 4) Incubator- 5) Hot Air Oven- 6) Autoclave-
7) Shaker- 8) Water bath - 9) Safety cabinet- 10) Microtome- 11) Electronic balance-
12) Electrophoresis Set- 13) Flame photometer- 14) Semi autoanalyser- 15) Computer-
16) ELISA Reader -

Working sections in laboratory:

1) Clinical pathology- 2) Bacteriology- 3) Serology- 4) Mycology- 5) Mycobacteriology-
6) Biochemistry- 7) Haematology - 8) Histopathology- 9) Phlebotomy -

Use of disposables : ..... **Use of needle destroyer** : .....

Specimen collected by: *1) Staff-* ..... *2) Others-* .....

Percentage of referred cases from Govt. Hospitals: .....

Lab accident/injury: .....

Hepatitis-B vaccination: .....

Reagents used : 1) In-house ..... 2) Commercial .....

Personal barrier: 1) Apron ..... 2) Gloves ..... 3) Mask ..... 4)Others.....

Water supply:.....

Power supply: Govt. supply / UPS / Generator / Other .....

Sanitation :.....

Laboratory Waste Management:

Inactivation of Waste: Yes..... [Chemical agent...../Autoclaving.....] / No.....

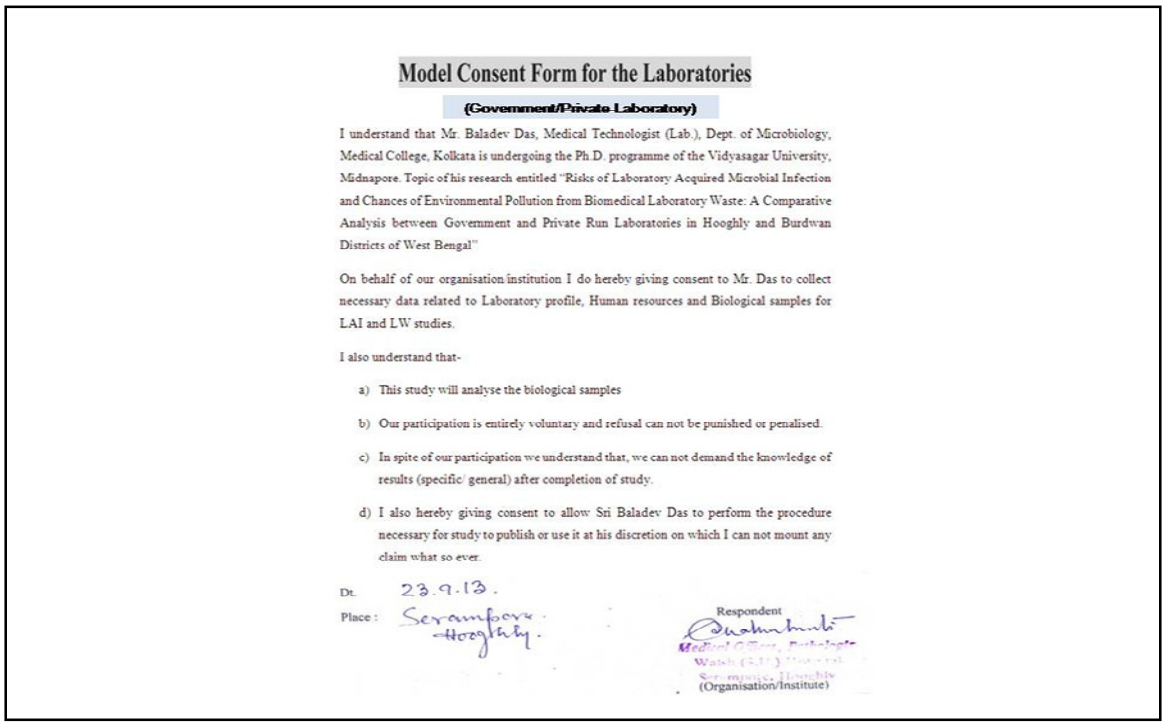
Lab. Waste disposal: *1) By agent .....* *2) By administration .....* *3) Self/Own .....*
4) Segregation : ..... done/ Not done

Method adopted: *1) Burial* *2) Incineration* *3) Common dumping*

Figure 1

The study has covered about 50% clinical laboratories of both government and private sector situated within 5 (five) km. radius surrounding the district/sub-divisional/rural hospitals of 'Hooghly' and 'Burdwan' district. These laboratories were selected randomly. The 'Corporation' and Municipal' areas were considered as urban sector where as the 'Panchayat' areas as rural sectors. The data regarding government and private registered laboratories were taken from the 'Directory of Medical Institutions–West Bengal 2004' and from the records of the office of 'Chief Medical Officer of Health' (CMOH), 'Hooghly' and 'Burdwan'. Out of hundred (100) laboratories, eighty five (85) laboratories from private sector and 15 laboratories from government sector were selected from four subdivisions viz. 'Chinsura' subdivision (Government sector laboratories=4, Private sector laboratories=24), **'**Chandannagar' subdivision (Government sector laboratories=4, Private sector laboratories=21), 'Serampore' subdivision (Government sector laboratories=4, Private sector laboratories=18) and 'Arambagh' subdivision (Government sector laboratories=3, Private sector laboratories=22) of 'Hooghly' district for this study. In 'Burdwan' district there were 6 subdivisions namely- Burdwan North Sub-Division (Government sector laboratories=3, Private sector laboratories=29), Burdwan South Sub-Division (Government sector laboratories=2, Private sector laboratories=6), Durgapur Sub-Division (Government sector laboratories=6, Private sector laboratories=18), Asansol Sub-Division (Government sector laboratories=4, Private sector laboratories=25), Kalna Sub-Division (Government sector laboratories=3, Private sector laboratories=9), Katwa Sub-Division (Government sector laboratories=2, Private sector laboratories=13). From these subdivisions hundred (100) private laboratories and twenty (20) government laboratories were selected for this study. Data were collected during the period of 2007 to 2012. An ethical clearance certificate was issued by 'The Principal and Chairman, Institutional Ethics Committee, Medical College & Hospital', Kolkata, Vide Memo No.- 5105/1(2) dated 08.12.2006 for conducting the research work. Ethical clearance certificate was also obtained from 'Institutional Ethics Committee, 'Vidyasagar University', Midnapore, Vide Memo No.- IEC/4/2/15 Dt. 19.6.15. Study protocol was explained to the laboratory

authority of the selected government and private laboratories and written consent was taken in a pre-standardized format as given below. This study was a cross sectional study. A pre-standardized questionnaire was used as a data collecting tool. The questionnaire is mentioned below.



Model Consent Form for the Laboratories

(Government/Private Laboratory)

I understand that Mr. Baladev Das, Medical Technologist (Lab.), Dept. of Microbiology, Medical College, Kolkata is undergoing the Ph.D. programme of the Vidyasagar University, Midnapore. Topic of his research entitled "Risks of Laboratory Acquired Microbial Infection and Chances of Environmental Pollution from Biomedical Laboratory Waste: A Comparative Analysis between Government and Private Run Laboratories in Hooghly and Burdwan Districts of West Bengal"

On behalf of our organisation/institution I do hereby giving consent to Mr. Das to collect necessary data related to Laboratory profile, Human resources and Biological samples for LAI and LW studies.

I also understand that-

a) This study will analyse the biological samples

b) Our participation is entirely voluntary and refusal can not be punished or penalised.

c) In spite of our participation we understand that, we can not demand the knowledge of results (specific/ general) after completion of study.

d) I also hereby giving consent to allow Sri Baladev Das to perform the procedure necessary for study to publish or use it at his discretion on which I can not mount any claim what so ever.

Dt. 23.9.13.

Place : Serampore - Hooghly.

Respondent

(Organisation/Institute)

Figure 2

Parameters included in the laboratory profile were -

A. Location of the laboratory i.e. rural, urban (consisting of corporation and municipality)
B. Category of the laboratory i.e. 'small', 'medium' or 'large'- classified according to 'West Bengal Clinical Establishment Act, 1950'(GWB, 1952)
C. Ownership of the laboratory in private sector that included 'Businessman or Medical Graduate or Technologist'.
D. Status of registration i.e. the government sector laboratories were considered as registered and the laboratories in private sector were registered with CMOH and few laboratories were running without any registration/license.
E. Laboratory waste management was under taken by the agency or self arranged.
F. Bio-safety and sanitation, depending on the system adopted or followed for personal protection, laboratory safety, use of disinfectants, cleanliness including room ventilation etc. the laboratories were graded as 'advance', 'average' and 'poor'. The 'advance' laboratories were further categorized as per bio-safety level-1, 2, 3 and 4.
G. Instrumentation of the laboratories were graded as –
    1) Advance: Having ELISA reader, automation in biochemistry and microbiology, bio-safety cabinet, provides histopathology and immunohistochemistry, PCR, electrophoresis set, HPLC etc.
    2) Average: Without above facilities but functioning with other instruments like Binocular Microscope and Semi autoanalyzer only.
    3) Poor: Performing works using colorimeter, centrifuge and monocular microscope only.
H. History of laboratory accident or injury occurred during last five years in this laboratory amongst the technical personnel i.e., needle stick injury, cut, aerosol infection from bacterial/viral culture, splash and ingestion of contaminated material. Information categorized as 'yes' or 'no'
I. Status of staff immunized with 'Hepatitis-B' vaccine was recorded as 'yes' or 'no'.
J. Laboratories were categorized in respect of source of power supply in the laboratory either arranged from public supply (designated as 'average') or having additional own system with public power supply (designated as 'good').
K. Source of water utilization by the laboratory either by own additional arrangement (designated as 'good') or public supply (designated as 'average') was recorded.

Intra and inter district comparison was performed with the data obtained in this study for any significant finding which could unveil the unidentified eminence of laboratory service and practices in two districts. For statistical hypothesis testing 'two-tail t-test' and 'Chi-square test' were performed (Kranzler and Moursund, 2007). All the data were compiled in Microsoft excel sheet. 'Statistical Package for Social Sciences' (SPSS), Version 19 was used for the calculation of data. P-value less than 0.05 were considered as significant difference (Das et al., 2001).

3. Results

Data collected during field survey about the laboratories included hundred (100) laboratories of four subdivisions in 'Hooghly' district out of which 85 laboratories from private sector and 15 from government sector. In 'Burdwan' district there were hundred (100) private laboratories and twenty (20) government laboratories were included for the study. The laboratory profile picture is presented for two districts as follows: -

3.1. Area Wise Distribution of Laboratories

Area wise distribution of government laboratories in 'Hooghly' district showed that in rural area the number was 60% (9), in municipal area it was 30% (5) and in corporation area the number was 10% (1). In private sector 35.23% (30) laboratories were in rural area, 51.76% (44) in municipal area and 12.94% (11) laboratories in corporation area. For 'Burdwan' district the distribution of government sector laboratories in different areas were 20% (4) in rural area, 50% (10) in municipal area and 30% (6) in corporation area. In private sector the distribution was 44% (44), 28% (28) and 28% (28) in above said three areas respectively (**Table-1**).

Hooghly district			
Area Authority	**Rural**	**Municipality**	**Corporation**
Government (100%; N=15)	**60% (9)**	30% (5)	10% (1)
Private (100%; N=85)	35.23% (30)	**51.76% (44)**	12.94% (11)

Burdwan district			
Area Authority	**Rural**	**Municipality**	**Corporation**
Government (100%; N=20)	20% (4)	**50% (10)**	30% (6)
Private (100%; N=100)	**44% (44)**	28% (28)	28% (28)

Table 1: Area wise distribution pattern of laboratories under study, in parenthesis, the number of laboratories has been indicated.

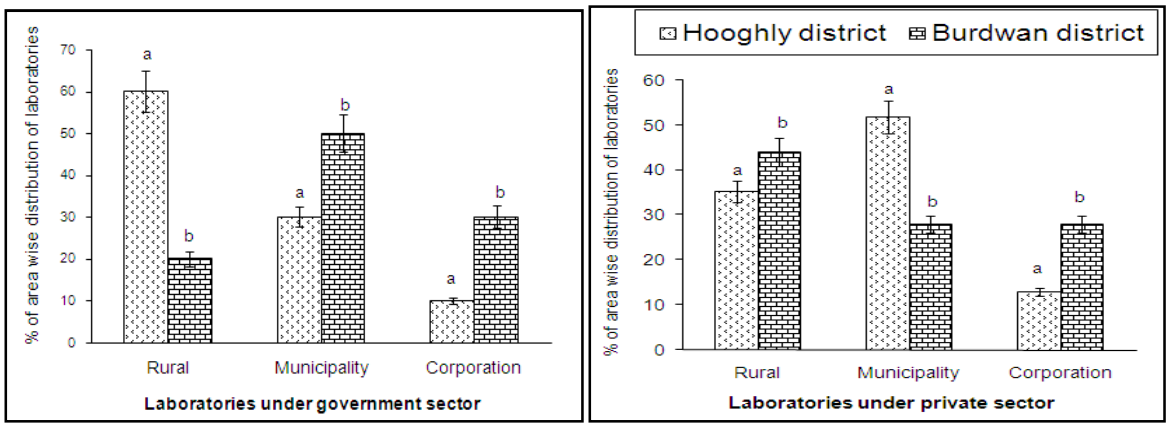


Figure 3: District wise comparison for area wise distribution pattern of laboratories under government and private sector. Each bar represents mean ± SEM. Analysis performed by student's two tail 't' test. Bars having different superscripts (a, b) differ from each other significantly at the level of p<0.01 or p<0.001.

It is evident from the comparative analysis between two districts that number of laboratories under government sector in 'Hooghly' district was higher than 'Burdwan' district in rural areas which were opposite in municipal and corporation areas. Laboratories under private sector were distributed more in number in the rural and corporation areas of 'Burdwan' district which was not found in municipal area of 'Hooghly' district. The numbers of laboratories under these categories in 'Hooghly' district were predominating.

3.2. Category of Laboratories

In 'Hooghly' district category wise distribution was 20% (3) for small, 53.3% (8) for medium and 26.7% (4) for large size laboratories in government sector. For private sector the distribution was 54.12% (46), 31.76% (27) and 14.12 % (12) respectively. In 'Burdwan' district government sector laboratories distribution was 20% (4) for small, 60% (12) for medium and 20% (4) for large size. In private sector said distribution were 34% (34), 47% (47) 19% (19) respectively. (Table 2)

Hooghly district			
Category Authority	**Small**	**Medium**	**Large**
Government (100%; N=15)	20% (3)	**53.3% (8)**	26.7% (4)
Private (100%; N=85)	**54.12% (46)**	31.76% (27)	14.12% (12)
Significant association between infrastructural level of health service providing institute and controlling authority, Chi-square test of independence 25.04, 2, <0.001 (χ^2-test, df, p-value)			

Burdwan district			
Category Authority	**Small**	**Medium**	**Large**
Government (100%; N=20)	20% (4)	**60% (12)**	20% (4)
Private (100%; N=100)	34% (34)	**47% (47)**	19% (19)
No significant association between infrastructural level of health service providing institute and controlling authority, Chi-square test of independence 5.24, 2, >0.05 (χ2-test, df, p-value)			

Table 2: Category of laboratories as per 'West Bengal Clinical Establishment Act-1950', in parenthesis the number of laboratories has been indicated.

Comparison of categories of two districts in government sector showed that large size laboratories were present more in number in 'Hooghly' district, where as in 'Burdwan' district it was opposite in case of medium size laboratories. Small size laboratories were equally distributed in both the districts. In case of private sector laboratories in 'Burdwan' district, the number were predominating in medium and large size laboratories where as in case of small laboratories number was higher in 'Hooghly' district.

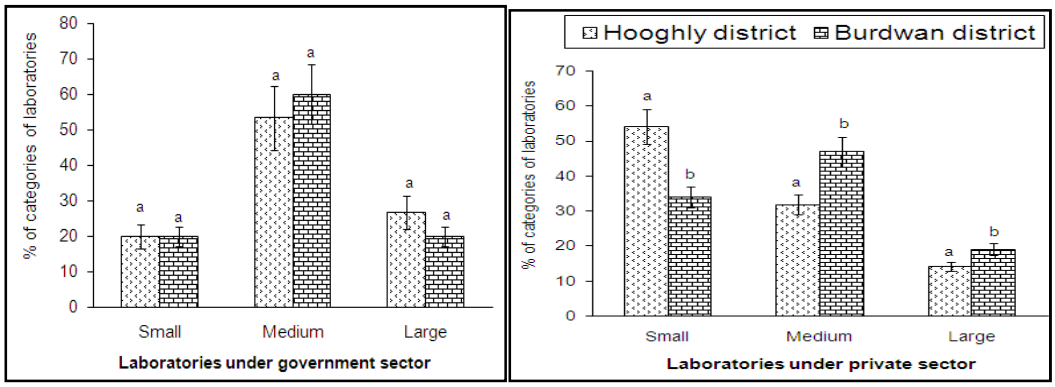


Figure 4: Inter district comparison for existence of government and private sector laboratories from the view point of category of laboratories. Each bar represents mean± SEM. Analysis performed by student's two tail 't' test. Bars having same superscript (a) did not differ from each other significantly at the level of p>0.05 where as bars having different superscripts (a, b) differ from each other significantly at the level of p<0.01 or p<0.001

3.3. Ownership of Laboratory

Out of 100% (N=85) private laboratories in 'Hooghly' district ownership of 16.47% (N=14) was medical graduates/post graduates, 28.23% (N=24) was the medical technologists and 55.29% (N=47) was businessmen. In case of 'Burdwan' district, out of 100% (N=100) private laboratories, ownership distribution pattern was 28% (N=28) by medical graduates, 31% (N=31) by medical technologists and 41% (N=41) by businessmen respectively. (Table 3)

Hooghly district			Burdwan district		
Government sector laboratories 100% (N=15)	**Private sector laboratories (100%; N=85)**		**Government sector laboratories 100% (N=20)**	**Private sector laboratories (100%; N=100)**	
	Medical Graduates/Post Graduates	16.47% (14±2.29)	**Ownership is not applicable here as it is under the regulation of government rule/act**	**Medical Graduates/Post Graduates**	28% (28±3.60)
Ownership is not applicable here as it is under the regulation of government rule/act	**Medical Technologists**	28.23% (24±3.89)		**Medical Technologists**	31% (31±2.89)
	Businessmen	**55.29% (47±5.24)**		**Businessmen**	**41% (41±3.71)**

Table 3: Ownership of the existing private sector laboratories under study, in parenthesis the number of laboratories has been indicated.

In both the districts, most of the private sector laboratories were governed by businessman than medical graduates/postgraduates or medical technologists.

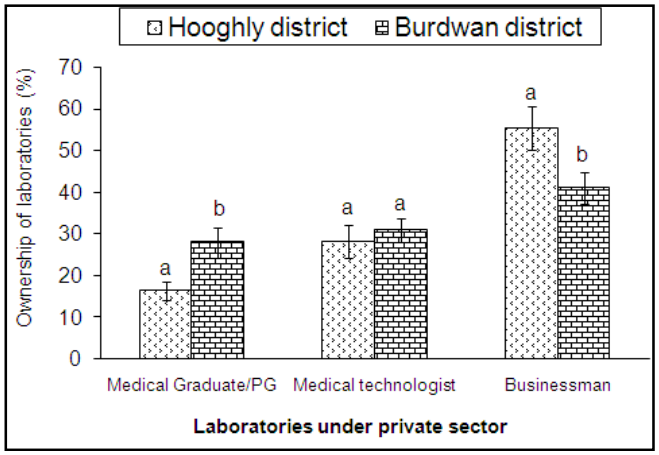


Figure 5: Significant variation in the number of laboratories controlled by medical graduates or businessmen between 'Hooghly' and 'Burdwan' districts though such significant difference not noted between the private laboratories of the two districts guided by medical technologists. Each bar represents mean± SEM. Analysis performed by student's two tail 't' test. Values with different superscript (a, b) differ from each other significantly at the level of p<0.01.

3.4. Registration of the Private Sector Laboratories

For 'Hooghly' district the picture exhibited that out of 100% (85) private laboratories, 89.41% (N=76) were registered and 10.59% (9) were unregistered. In 'Burdwan' district out of 100% (100) private laboratories, 92% (92) were registered and 8% (8) were unregistered. Registration is not applicable for government sector laboratories of both the districts. (Table 4)

Hooghly district		
	Registered	**Non-registered**
Government sector laboratories (100%; N=15)	**100% (N=15)**	----------
Private sector laboratories (100%; N=85)	**89.41% (N=76)**	10.59% (N=9)

Burdwan district		
	Registered	**Non-registered**
Government sector laboratories (100%; N=20)	**100% (N=20)**	----------
Private sector laboratories (100%; N=100)	**92% (N=92)**	8% (N=8)

Table 4: Registration status of the private sector laboratories and their comparisons, in parenthesis, the number of laboratories has been indicated.

Regarding registration of the laboratories the comparative study showed that most of the laboratories in both the districts were registered with their concerned 'CMOH' offices. In 'Hooghly' district 89.41% laboratories and in 'Burdwan' district 92% laboratories were registered respectively. Rest of the laboratories (10.59%) in 'Hooghly' district and 8% in 'Burdwan' district remained unregistered.

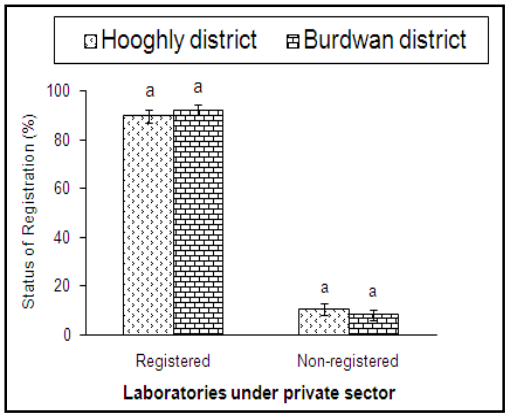


Figure 6: Inter district variation in the number of registered laboratories under private sector between 'Hooghly' and 'Burdwan' district. Each bar represents mean± SEM. Analysis performed by student's two tail 't' test. Bars having same superscript (a) did not differ from each other significantly at the level of p>0.05.

3.5. Laboratory Waste Management

In 'Hooghly' district out of 100% (15) government laboratories 60% (9) had their waste disposal service contact with 'Bio Medical Waste' (BMW) management agencies. Only 40% (6) laboratories had their own in-house system. In private sector, out of 100% (85) laboratories 95.3% (81) depended on agencies, where as 4.7% (4) laboratories had their in-house management system. In case of 'Burdwan' district out of 100% (20) government laboratories 60% (12) depended on agencies and the rest 40% (8) maintained their own system. For private sector, out of 100% (100) laboratories, 90% (90) laboratories depended on agencies where as only 10% (10) used their own in-house system for this purpose. (Table 5)

Hooghly district		
Waste Management Status Governing authority	**Own /In-house**	**Agency**
Government sector laboratories (100%; N=15)	40% (6)	**60% (9)**
Private sector laboratories (100%; N=85)	4.7% (4)	**95.3% (81)**
Significant association between non parametric variables like the status of laboratory waste management by agency/in-house and governing system of the laboratory (Govt. /Pvt.), Chi square test of independence 35.9,1,<0.001 (χ^2-test,df, p-value)		

Burdwan district		
Waste Management Status Governing authority	**Own /In-house**	**Agency**
Government sector laboratories (100%; N=20)	40% (8)	**60% (12)**
Private sector laboratories (100%; N=100)	10% (10)	**90% (90)**
Significant association between non parametric variables like the status of laboratory waste management by agency/in-house with governing system of the laboratory (Govt. /Pvt.), Chi square test of independence 24,1,<0.001 (χ^2-test,df, p-value)		

Table 5: Laboratory waste management status of two districts, in parenthesis the number of laboratories has been indicated.

Waste management systems were maintained by the government sector laboratories in two districts equally for "own/in-house" ('Hooghly' district 40% and 'Burdwan' district 40%) and "agency" ('Hooghly' district 60% and 'Burdwan' district 60%) category. Where as, under private sector waste management system found depended mostly on the agencies in both districts. Very few laboratories were working with their own/in-house waste management systems.

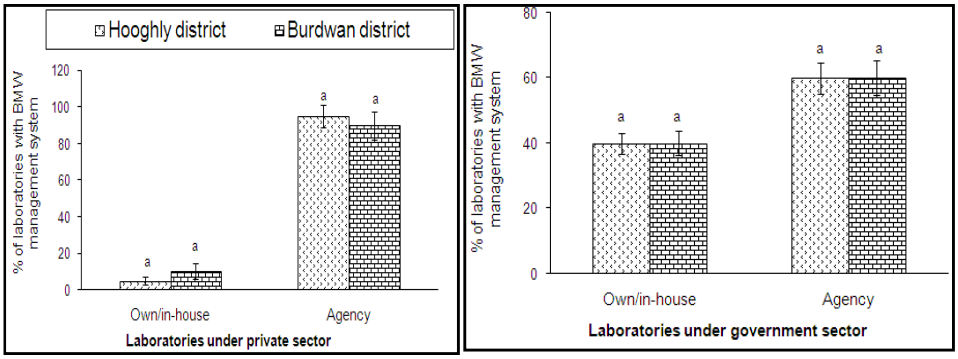


Figure 7: Biomedical waste management status adopted in government and private sector laboratories and their inter district comparison. Each bar represents mean± SEM. Analysis performed by student's two tail 't' test. Bars having same superscript (a) did not differ from each other significantly at the level of p>0.05.

3.6. Bio-Safety / Sanitation

In 'Hooghly' district the laboratories were categorized under this parameter as advance 66.6% (10), average 13.3% (2) and poor 20% (3) amongst 100% (15) government laboratories. In private sector out of 100% (85) laboratories the said categories constituted with 16.4% (14), 16.4% (14) and 67.05% (57) respectively. Amongst 100% (20) government laboratories in 'Burdwan' district, 20% (4) were counted as advance, 40% (8) as average and 40% (8) as poor category. In this district 20% (20), 12% (12) and 68% (68) laboratories were categorized as advance, average and poor in private sector out of 100% (100) laboratories. (Table 7)

Hooghly District				
Bio-safety/Sanitation Governing authority	**Advance**	**Average**	**Poor**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N=15)	**66.6% (N=10)**	13.3% (N=2)	20% (N=3)	Chi square test of independence, **56.12, 2, <0.001**
Private sector laboratories (100%; N=85)	16.4% (N=14)	16.4% (N=14)	**67.05% (N=57)**	

Burdwan District				
Bio-safety/ Sanitation Governing authority	**Advance**	**Average**	**Poor**	**χ^2-test, df, p-value**
Government sector laboratories (100%; N= 20)	20% (N=4)	**40% (N=8)**	**40% (N=8)**	Chi square test of independence, **22.34, 2, <0.001**
Private sector laboratories (100%; N= 100)	20% (N=20)	12% (N=12)	**68% (N=68)**	

Table 6: Bio-safety and sanitation maintenance by the laboratories in two districts, in parenthesis the number of laboratories has been indicated.

Chi square test has been performed to find out the association between nonparametric variables like governing system and bio-safety/sanitation level. A significant association was found in both districts, p <0.001

Advance bio-safety and sanitation were maintained by the laboratories under government sector found in more in number in 'Hooghly' district where as in 'Burdwan' district the higher number of laboratories were found in respect of average and poor bio-safety and sanitation through 'Hooghly' district. In case of the laboratories under private sector maintenance of poor bio-safety and sanitation were observed in major number in both the districts. In this sector the number of advance category laboratories found higher in number in 'Burdwan' district (20%) than in 'Hooghly' district (16.4%). Lowest percentage was observed in 'Burdwan' district for average category in this parameter.

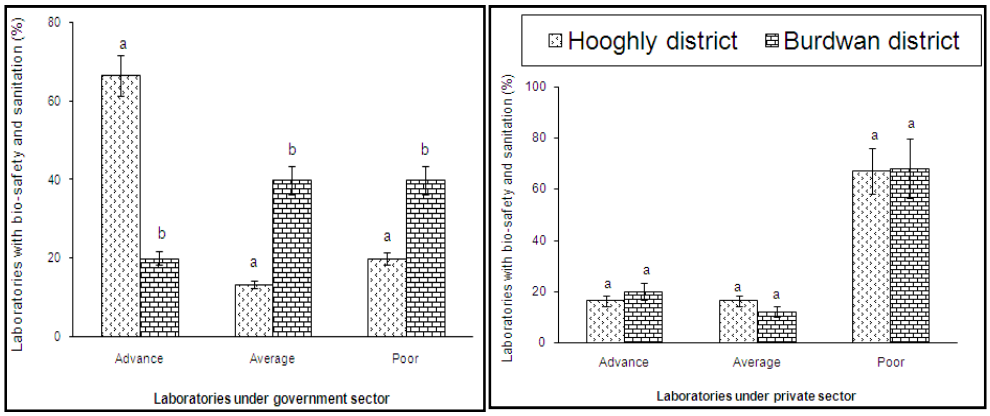


Figure 8: Laboratories under government and private sector with different bio-safety/sanitation profile and their inter district comparative analysis. Each bar represents values in. Analysis performed by Student's two tail 't' test. Bars having different superscripts (a, b) indicated significant difference (p<0.001) and bars having same superscript (a) did not differ from each other significantly at the level of p>0.05.

3.7. Bio-Safety Level Maintained by the 'Advance' Laboratories

Among 100% (10) 'Advance' grade laboratories of the government sector in 'Hooghly' district there were 10% (1) laboratories bearing bio-safety level-1 status. None of them maintained any other bio-safety level. In private sector 14.2% (2) and 7.1% (1) laboratories showed bio-safety level-1 and bio-safety level-2, respectively in the said district. Bio-safety level-3 and bio-safety level-4 category laboratories were not in existence in that district. In case of 'Burdwan' district in government sector, out of 100% (4), 75% (3) laboratories were bearing with bio-safety level-1 and 25% (1) laboratories found with bio-safety level-2. In private sector among 100% (25) 'Advance' grade laboratories bio-safety level-1 status was maintained by 15% (3) laboratories and bio-safety level-2 status was maintained by 10% (2) laboratories only. Bio-safety level-3 and bio-safety level-4 were not found in any percentage of the laboratory of 'Burdwan' district. (Table 7).

Hooghly district					
Status of Bio-safety level Governing authority	**Advance laboratory**				**χ^2-test,df, p-value**
	BSL-1	**BSL-2**	**BSL-3**	**BSL–4**	
Government sector laboratories (100%; N=10)	**10% (N=1)**	0	0	**0**	Chi square test of independence, **13.98, 1, <0.001**
Private sector laboratories (100%; N=14)	14.2% (N=2)	7.1% (1)	0	0	

Burdwan district					
Status of Bio-safety level Governing authority	**Advance laboratory**				**χ^2-test,df, p-value**
	BSL-1	**BSL-2**	**BSL-3**	**BSL–4**	
Government sector laboratories (100%; N=4)	**75% (N=3)**	25% (1)	0	**0**	Chi square test of independence, **2.23, 1, >0.05**
Private sector laboratories (100%; N=25)	**15% (N=3)**	10% (2)	0	0	

Table 7: Bio-safety level maintenance by the laboratories in two districts, in parenthesis the number of laboratories has been indicated.

Chi square test has been performed to find out the association between nonparametric variables like governing system and status of bio-safety level. A significant association was found in 'Hooghly' districts, $p < 0.001$ and insignificant association was found in 'Burdwan' districts, $p > 0.05$.

3.8. Instrumentation Status of Laboratory

In 'Hooghly' district amongst 100% (15) government laboratories, 13.3% (2) were equipped with advanced instruments. Average instrumentation status was found in 66.6% (10) and rest 20% (3) were equipped with poor instrumentation infrastructure. For private sector, out of 100% (85) laboratories 18.8% (16) were advanced in type, 55.3% (47) were average in type and 25.9% (22) were poor in type regarding this parameter. In 'Burdwan' district under government sector 25% (5) as advance, 60% (12) as average and 15% (3) as poor category out of 100% (20) laboratories. In private sector of this district the number were 16% (16) as advanced, 64% (64) as average and 20% (20) as poor category. (Table 8)

Hooghly district				
Instrumentation status Governing authority	**Advance**	**Average**	**Poor**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N=15)	13.3% (N= 2)	**66.6% (N= 10)**	20% (N= 3)	Chi square test of independence, **2.75,2, >0.05**
Private sector laboratories (100%; N=85)	18.8% (N= 16)	**55.3% (N= 47)**	25.9% (N=22)	

Burdwan district				
Instrumentation status Governing authority	**Advance**	**Average**	**Poor**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N= 20)	25% (N= 5)	**60% (N= 12)**	15% (N= 3)	Chi square test of independence, **2.09,2,>0.05**
Private sector laboratories (100%; N= 100)	16% (N= 16)	**64% (N= 64)**	20% (N=20)	

Table 8: Quality of laboratories from the view point of instrumentation. In parenthesis the number of laboratories has been indicated.

χ^2-test of independence has been performed to find out the association between the non parametric variables i.e. laboratory instrumentation facility and governing system. Insignificant association was found in both districts, $p > 0.05$

The government sector laboratories were running with average instrumentation which was predominating in number in both districts. 'Hooghly' district consisted higher number (66.6%) in respect of 'Burdwan' district (60%) for advance category. 'Burdwan' district remained in the higher position (25%) than 'Hooghly' (13.3%). The laboratories in 'Hooghly' district showed higher number (20%) than 'Burdwan' district (15%) which maintained poor quality of instrumentation. In case of private sector laboratories higher number (18.8%) was observed in 'Hooghly' district than 'Burdwan' district (16%) for average instrumentation. The laboratories of 'Burdwan' district were predominating (64%) in respect of 'Hooghly' (55.3%) for average category. On the other hand the numbers of laboratories were found working with poor quality of instrumentation observed higher in number (25.9%) in 'Hooghly' district than in 'Burdwan' district (20%).

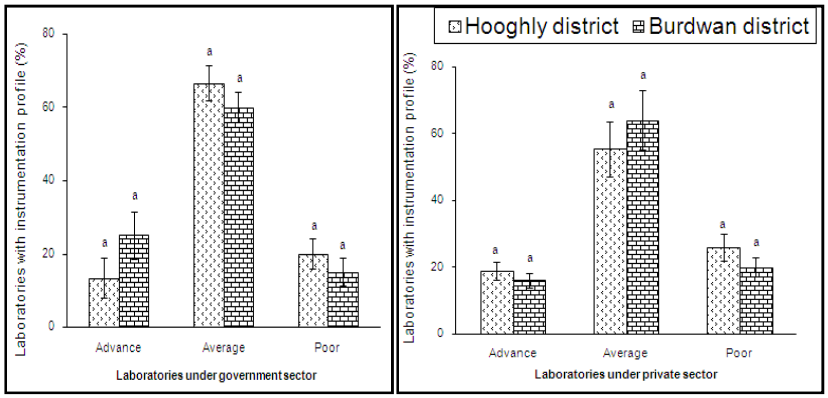


Figure 9: Inter district comparison from the view point of instrumentation profile of government and private sector laboratories. Each bar represents mean± SEM. Analysis performed by student's two tail 't' test.
Bars having same superscript (a) did not differ from each other significantly at the level of p>0.05.

3.9. Laboratory Accident/Injury

Out of 100% (15) government laboratories in 'Hooghly' district, incident of accidents were occurred in 66.7% (10) laboratories. In private sector out of 100% (85) laboratories, accident reported by 11.8% (10). In 'Burdwan' district incident of laboratory accident were occurred in 55% (11) laboratories amongst 20 government laboratories. In private sector out of 100 % (100) laboratories, accident took place in 12% (12) comparatively described. **(Table 9)**

'Hooghly' district			
Incident of laboratory accident/ injury Governing authority	**Yes**	**No**	**p-value**
Government sector laboratories (100%; N=15)	**66.7% (10±1.21[a])**	33.3% (5±0.99[b])	<0.001
Private sector laboratories (100%; N=85)	11.8% (10±1.19[a])	**88.2% (75±3.19[b])**	<0.001

Burdwan district			
Incident of laboratory accident/injury Governing authority	**Yes**	**No**	**p-value**
Government sector laboratories (100%; N=20)	**55% (11±1.03[a])**	45% (9±0.83[a])	>0.05
Private sector laboratories (100%; N=100)	12% (12±1.09[a])	**88% (88±3.63[b])**	<0.001

Table 9: Incident of laboratory accident or injury in two districts (within last five years), in parenthesis the number of laboratories has been indicated.

Each row represents mean± SEM for each group. Analysis has been performed to find out the association between laboratory accident or injury profile and governing system by student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly at the level of p<0.001

Incidents of laboratory accident occurred more (66.7%) in 'Hooghly' district than 'Burdwan' district (55%) in government sector laboratories. In case of private sector laboratories a low rate and almost equal of laboratory accidents was observed in both districts ('Hooghly' district, 11.8% and 'Burdwan' district, 12% respectively).

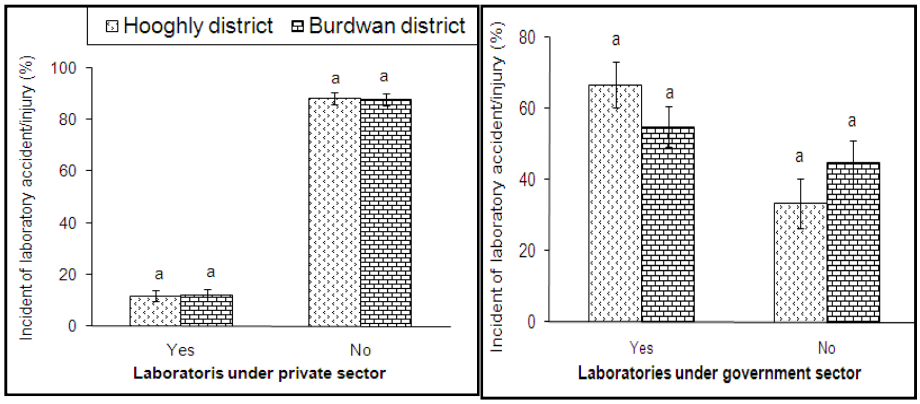


Figure 10: Variation in the incident of laboratory accident/injury under government and private sector laboratories in 'Hooghly' and 'Burdwan' district. Each bar represents mean± SEM. Analysis performed by student's two tail 't' test. Values with same superscript (a) does not differ from each other significantly at the level of p>0.05.

3.10. Staff Immunized With 'Hepatitis-B' Vaccine

In 100% (15) government laboratories of 'Hooghly' district 20% (3) laboratories found with immunized staff and in private sector out of 100% (85) laboratories 31.7% (27) reported running with immunized staffs. In case of 'Burdwan' district the staff immunized in government (100%, 20) and private sector (100%, 100) laboratories were 60% (12) and 56% (56) respectively within 100%. (Table 10)

'Hooghly' district			
Immunization status of staff Governing authority	**Yes**	**No**	**p-value**
Government sector laboratories (100%; N=15)	20% (3±0.99[a])	**80% (12±1.01[b])**	p<0.001
Private sector laboratories (100%; N=85)	31.77% (27±2.21[a])	**68.23% (58±3.18[b])**	p<0.001

'Burdwan' district			
Immunization status of staff Governing authority	**Yes**	**No**	**p-value**
Government sector laboratories (100%; N=20)	**60% (12±1.13[a])**	40% (8±1.11[a])	p>0.05
Private sector laboratories (100%; N=100)	**56% (56±3.10[a])**	44% (44±2.91[b])	p<0.001

Table 10: Status of staff immunized with 'Hepatitis-B' vaccine in two districts, in parenthesis the number of laboratories has been indicated.

Each horizontal row represents mean ± SEM for each group. Analysis performed by student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly at the level of p<0.001

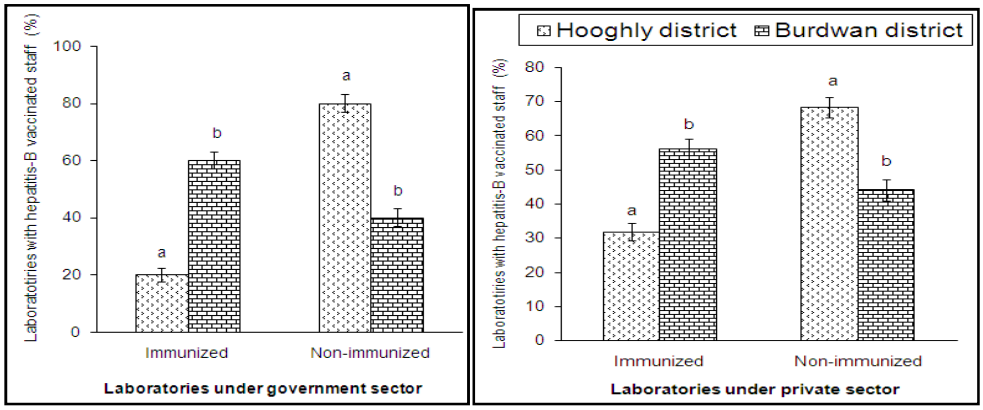


Figure 11: Study of immunization status of laboratory staff in two different governing authorities in both districts and their comparison. Each bar represents mean ± SEM. Analysis performed by student's two tail 't' test. Values with different superscripts (a, b) differ from each other significantly at the level of p<0.001

Percentage of immunized staff with 'Hepatitis-B' vaccine was observed higher (60%) in 'Burdwan' district than in 'Hooghly' district (20%) under government sector laboratories. In private sector the status remained higher in 'Burdwan' district (56%) than in 'Hooghly' district (31.77%).

3.11. Source of Power Supply into Laboratory

In government sector of 'Hooghly' district 100% (15) laboratories were provided with public power supply system. In private sector 88.2% (75) laboratories were enriched with public power supply and rests 11.76% (10) private laboratories had also their own additional power supply arrangement. In 'Burdwan' district all the 100% (20) government laboratories utilized the public power supply where as in private sector amongst 100% (100) laboratories 82% (82) enjoyed public supply and 18% (18) laboratories utilized public supply in addition to their own arrangement. (Table 11)

Hooghly district			
Power resource **Governing authority**	**Public Supply /Average**	**Additional own supply /Good**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N=15)	**100% (N=15)**	0% (00)	Significant association between non parametric variables like power resource and governing authority of the laboratories, Chi square test of independence, 12.50,1,<0.001
Private sector laboratories (100%; N=85)	**88.24% (N=75)**	11.76% (N=10)	

Burdwan district			
Power resource **Governing authority**	**Public Supply**	**Additional own supply /Good**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N=20)	**100% (N=20)**	0% (00)	Significant association between non parametric variables power resource and governing authority of the laboratories, Chi square test of independence, 19.78,1,<0.001
Private sector laboratories (100%; N=100)	**82% (N=82)**	18% (N=18)	

Table 11: Resources of electricity/power supply into the laboratories in two districts, in parenthesis the number of laboratories has been indicated.

Laboratories under private sector were running with public power supply were higher in 'Hooghly' district (88.2%) than in 'Burdwan' district (82%). Number of laboratories having additional own power supply system were found more in 'Burdwan' district (18%) than in 'Hooghly' district (11.76%). Hundred (100%) laboratories under government sector were utilizing the public electricity supply system.

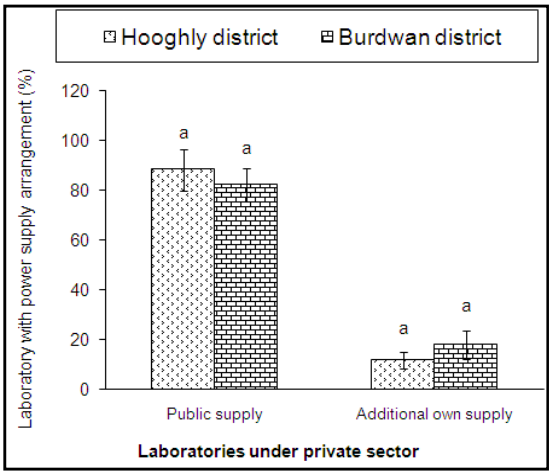


Figure 12: Resources of electric power supply to private sector laboratories and their inter district comparative analysis. Each bar represents mean ± SEM. Analysis performed by student's two tail 't' test. Bars having same superscript (a) did not differ from each other significantly at the level of p>0.05.

3.12. Source of Water Supply into Laboratory

In 'Hooghly' district out of 100% (15) government laboratories 60% (9) used public water supply and 40% (6) laboratories utilized their own facilities respectively. In private sector 76.47% (65) laboratories enjoyed the public supply; where as 23.5% (20) laboratories utilized their own system. Both public water supply and own water supply systems were found in 50% (10) of laboratories

out of 100%, (20) government sector laboratories of 'Burdwan' district. In private sector out of 100% (100) laboratories the number belonged in two groups were 74% (74) and 26% (26) respectively. (Table 12)

Hooghly district			
Water resource Governing authority	**Public Supply /Average**	**Own arrangement /Good**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N=15)	**60% (N= 9)**	40% (N= 6)	Significant association between non parametric variables i.e. water resource and governing authority of the laboratories, Chi square test of independence, 6.28,1, <0.01
Private sector laboratories (100%; N=85)	**76.47% (N= 65)**	23.5% (N= 20)	

Burdwan district			
Water resource Governing authority	**Public supply /Average**	**Own arrangement /Good**	**χ^2-test,df, p-value**
Government sector laboratories (100%; N=20)	**50% (N=10)**	**50% (N=10)**	Significant association between non parametric variables like water resource and governing authority of the laboratories, Chi square test of independence, 12.22,1,<0.001
Private sector laboratories (100%; N=100)	**74% (N=74)**	26% (N=26)	

Table 12: Resources of water supply in laboratories in two districts, in parenthesis, the number of laboratories has been indicated

Inter district comparative analysis of government sector laboratories with public water supply resources showed higher number in 'Hooghly' district (60%) than 'Burdwan' district (50%). The number of laboratories utilised their own arrangement found in higher number in 'Burdwan' district (50%) than in 'Hooghly' district (40%). For private sector public water supply enjoyed more by the 'Hooghly' district's laboratories (76.47%) than in 'Burdwan' district (74%) where as laboratories were more in number in 'Burdwan' district (26%) than in 'Hooghly' district (23.5%) who had their own arrangement.

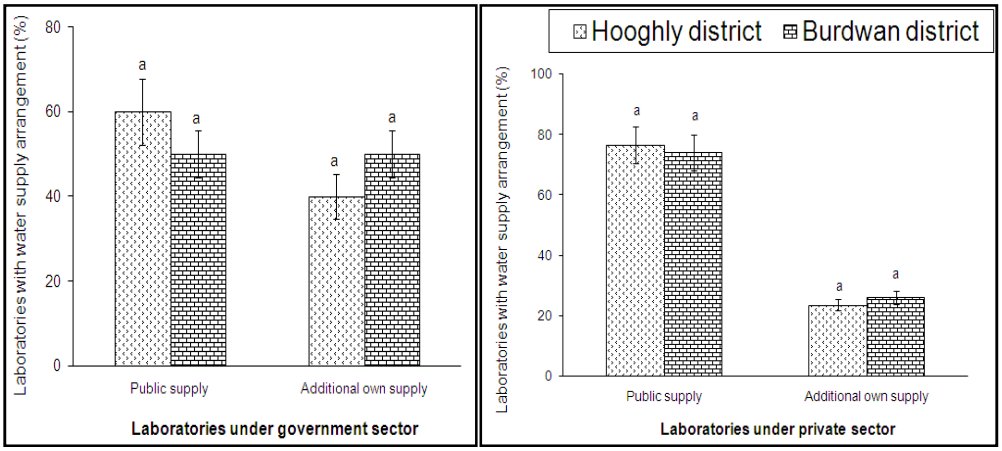


Figure 13: Inter district comparative analysis for government and private sector laboratories from the view point of resources of water supply to laboratories. Each bar represents mean ± SEM. Analysis performed by student's two tail 't' test. Bars having same superscript (a) did not differ from each other significantly at the level of p>0.05.

4. Discussion

In the present study 'Hooghly' and 'Burdwan' district were selected as study area for various reasons are mentioned below -

1. District 'Hooghly' is one of the literally developed districts in West Bengal. Rate of literacy is higher (82.55%) in comparison to 'Burdwan' district (77.15%). Health consciousness among the general people expected to be above average in 'Hooghly' district. Since, a long past the district is enriched with several jute, cotton and manufacturing industries along the side of the bank of river 'Hooghly'. Large numbers of their employees depend on a good number of diagnostics laboratories during their treatment. On the other hand 'Burdwan' district is also having a mining and industrial area. Employees of those fields avail the laboratory services from both the government and private sectors. From the view point of general ailments

and occupational health hazards both the districts may demand an advanced and good laboratory services. For our study two said districts were selected to search out the actual facilities available to the patient community in this sector of healthcare services.

2. 'Burdwan' is an immediate neighbouring district of 'Hooghly'. It has two medical colleges, which is lacking in the district of 'Hooghly'. There are three paramedical training institutes running in 'Burdwan' districts where as only one government recognized paramedical institutes exists in 'Hooghly' district to train up the technologists. If there is any remarkable difference in attitude of laboratory practices in two districts as reflection of the health institutions that can be observed in our study.
3. Since last few decades the corporate health sectors showed their interests to invest a huge amount of money in several districts of West Bengal. 'Burdwan' district is one of their choice, because a large number of patients from surrounding districts and even from the neighbouring states 'Jharkhand' and 'Bihar' prefer to be treated there already a few medical hubs are engaged, which are run by the large corporate houses. Dearth of corporate investments in these sectors in 'Hooghly' district is noticeable. From the view point of business in laboratory services, the facilities provided by the establishment in two districts could be finding out in our study.
4. We selected the said two districts for convenience of our study. Both the districts are well connected by railways and surface transport. To attain the laboratories under study for survey work or to collect biological samples good conveyances are also needed. Collected samples could be processed in time to obtain a quality result of its analysis.
5. 'Hooghly' is smaller by area (3194 km^2) with higher population density (1753/km^2) in comparison to 'Burdwan' district (Area-7024 km^2) having lower population density (1099/km^2) as per Census report, 2011, Govt. of India (ORGI, 2011). Administrative role for regulating the laboratory services may be a matter for those districts, which may enlighten any new dimension of this study.
6. Advance diagnostic service is still dependent on Kolkata, the capital city of West Bengal. In respect of distance of two districts form Kolkata, the need of infrastructural development and quality manpower to cater the advance laboratory services in the said districts may give new findings in our study.

Sub-division wise distribution of the selected laboratories in 'Hooghly' and 'Burdwan' districts showed that private sector laboratories are more in number than government sector to provide the laboratory services to the ailing population. In government sector usually the laboratories are attached with a hospital where as in private sector one laboratory can run individually with an investment of less capital (MOH, 2007; NABL, 2008). Need based services may be provided in private sector with an early decision. From the Table 1 it was evident that laboratory facilities were provided more in urban area than in rural area in both of the districts. From present findings we noticed that the private sector laboratories were also dominating in number than government sector laboratories in a way to our previous findings (Das et al., 2002). Health facilities are concentrated mostly in urban area for its coverage of large population and people may have the option for availing alternative in urban area (Setia et al., 2013). Awareness level of the urban population is higher than of rural population may demand more laboratory set up in urban area. Distribution of government laboratories was the matter of health policies of the government, which were utilising to cater the services in those areas. In case of private sector, need of pathological laboratories could be meet up by the capability of owners, provision of business at a site. In 'Burdwan' district in private sector numbers of laboratories found more in rural and corporation areas than in 'Hooghly' district, which may be resulted from the expectation of viability and good prospect of the business. Less number of government and private sector laboratories was found in corporation areas in 'Hooghly' district than in 'Burdwan' district as the areas were existing under the corporation is larger in 'Burdwan' district than in 'Hooghly' district. Chandan Nagar, a small area in 'Hooghly' district is designated as corporation where as in 'Burdwan' district two corporations viz. Durgapur and Asansol covered larger areas (Figure 3).

Table 2 showed that the number of medium size laboratories in government sector were highest in both the districts followed by small-size and large size laboratories. It denoted that the large size laboratory services were unavailable there. Large size laboratories require bulk number of samples for advanced test items, which are usually asked by the tertiary care institutions. In district level such type of institutions are scanty. Hence, the dearth of large size laboratories may be due to lack of large hospitals or health care institutions in the said two districts. The private sector laboratories in 'Hooghly' district, number of small size laboratory is predominating followed by medium and large size laboratories where as in 'Burdwan' district the number of medium size laboratories is found pre-dominating followed by small and large size laboratories. The pictures in 'Hooghly' district may be due to motivation of less investment of money in the laboratory business as well as the entrepreneurs are engaged more in number with a minimum infrastructure to run the laboratories of small or medium size. The scenario in the district of 'Burdwan' may be resulted from the better capability of investment of entrepreneurs or due to an indirect effect of demand from the patient community with a better health consciousness in that district. In government sector the categories of laboratories in two districts absolutely dependent on the health policies of the government. From Figure 4 it was evident that small size laboratories in government sector of both the districts distributed as the result of government policies. In rural sector of 'Hooghly' district small size laboratories predominating as the entrepreneurs are more engaged with a small capital where as large investment and effect of medical colleges on the general people may be a cause for it in 'Burdwan' district. Regarding ownership of the private sector laboratories Table 3 described that in both districts businessmen were the pre-dominating in number followed by the medical technologists and medical graduates. This indicated that investment of money in this field may be a factor which is easier for the businessmen (Setia et al., 2013). Medical technologist's involvement may be due to their self employment entrepreneurship and the medical graduates may have engagement in other branches of medicines, so lesser in number in this field, which is supported by other observation (Patil et al., 2013). Figure 5 revealed that

ownership of the laboratories in 'Burdwan' district showed a higher percentage for the medical and paramedical profession which was a direct effect of the medical institution in that district, who supplied the necessary human resources. In 'Hooghly' district the businessman positioned better than 'Burdwan' district perhaps due to the shortage and less interest of medical and paramedical professionals to invest in this line. The businessmen occupied the areas of Hooghly district with a small amount of investment to start a laboratory. Table 4 showed that most of the private sector laboratories were found registered with office of the Chief Medical Officer of Health of the concerned district to run their laboratory establishment (MOH, 2007). Registration of private sector laboratories for every district was mandatory. Accordingly laboratories of both the districts showed an applicable result. A low percentage was recorded without registration perhaps they were undergoing the procedure and awaiting to obtain the said registration from the district health authorities (Figure 6). Findings of results from Table 5 revealed that biomedical wastes generated by the laboratories were collected by the private agencies, which was strictly implemented in private sector. Government sector laboratories were lagging behind in this concern, which is being expected for earlier implementation. Proper disposal of the biomedical wastes generated in private sector laboratories were over looked as the laboratory had to pay monthly a fixed amount of money (SEMP, 2005), which may create financial burden to the small laboratories (Jha et al., 2012). To prevent the chances of environmental pollution waste management systems should be followed strictly both in government and private sectors. An alternative in-house biomedical waste management system may be developed for those laboratories of remote areas where the private biomedical waste management agencies are unable to serve properly. Waste management status of the laboratories in both government and private sectors almost equal in two districts (Figure 7). In-house management system is still in vogue in government sector of both the district. Hope the total waste management systems for every sector's laboratories would be controlled by the agencies. The licensing authorities are also being regulated by the 'West Bengal Pollution Control Board' in this concern. Poor sanitation and bio-safety measures were observed in majority of the laboratories in both the districts with an exception in government sector laboratories of 'Hooghly' district (Table 6). A minimal percentage of laboratories of both the sectors were lagging behind to maintain the advanced bio-safety and sanitation measures. Percentage of 'Average' bio-safety maintenance and sanitation was found quite higher in government sector laboratory in 'Burdwan' district. Existence of medical colleges and training institutes for paramedics in 'Burdwan' district may help to develop this good laboratory practice which included better bio-safety measures of the laboratories. The poor sanitation and bio-safety measures in private sectors laboratories of both the districts under study may be a result of inadequate supervision and inspection of the district health controlling authorities. Inspection and regular vigilance by the controlling authorities may improve the condition. Participation of the laboratories under various accreditation schemes may improve these deficits.

Bio-safety and sanitation was a matter of view of the local administration in government sector laboratories and owner of private laboratories. Regular visit and monitoring of the government sector laboratories in 'Hooghly' district health authorities may have produced a better result for advance sanitation. Distance from the district head quarter to the government laboratories may be lacked the necessary supervision regularly for the 'Burdwan' district (Figure 8). In private sector poor sanitation in both the districts were observed as a result of the mentality and giving less importance. Sanitation should be a point of importance to issue the registration of laboratories. Chances of contamination, LAI and environmental pollution could be reduced by regulating that habit of the laboratories. Regarding instrumentation of laboratories, the findings of these two districts did not show any significant difference in all categories (Table 8). Number of laboratories with average instrumentation is highest, followed by poor and advance category both in government and private sector. Due to inadequate supervision by the district health authorities and the intension of more profit with low investment lead a trend to run the laboratories with average instrumentation without maintaining quality of the laboratory, which is consistent to our previous observation (Das et al., 2001). The laboratories may undergo quality control programme on regular basis which will enhance the laboratories for better instrumentation (Jha et al., 2012). Accreditation under NABL (NABL, 2008) may be effective to overcome the crisis. Lack of skilled technologists to handle advance instrument in the laboratories of both the districts may cause the existence of average laboratory instrumentation. Staff training and educational programme in laboratory sciences needed advancement up to university level, which may be effective for better exposure to advance instruments (Ciorlia and Zanetta, 2005). Average instrumentation is essential to run the laboratories for their professional existence. Hence, in both the districts in private and government sector laboratories were equipped with average instrumentation (Figure 9). Poorer instrumentation was marked in private sector laboratories of 'Hooghly' district, perhaps due to their inability of investment into the establishments. Only a very few laboratories were equipped with bio-safety cabinet and maintained the standard up to bio-safety level-2 and bio-safety level-1. In 'Burdwan' district maintenance of bio-safety level-2 and bio-safety level-1 were higher in laboratories of both the government and private sectors than in 'Hooghly' district (Table 7). Occurrences of laboratory accidents or injuries were reported in both government and private sector laboratories with a higher incident rate in government sector in both the districts (Table 9). Standard personal protection measures would be followed to prevent laboratory acquired infections through laboratory accidents (Garner, 1996). Continuing medical education programmes through workshop, seminar and refresher's course in respect of bio-safety for laboratory personnel would be of immense help to combat the incidents (Ciorlia and Zanetta, 2005).

Laboratory accidents observed more in government sector laboratories in both the districts, resulted from the patient rushes and casual mentality of the government servants, which did not differ in government sector data significantly in two districts (Figure 10). Number of staff, immunized against 'Hepatitis-B' virus was low in 'Hooghly' district in comparison to 'Burdwan' district (Table 10). There may be a lack of awareness of personal prophylaxis and probably no or little vaccination option available to them (Hadadi et al., 2008). In 'Burdwan' district, existence of better health awareness among health workers due to dissemination of knowledge from medical colleges to private laboratories regarding prevention of infectious diseases may inspire them to take better personal protective measure against 'Hepatitis B' virus infection by vaccination (Ciorlia and Zanetta, 2005). Personal affordability is better in comparison to 'Hooghly' district, which may lead self motivation among the laboratory workers in 'Burdwan' to be personally protected with

'Hepatitis-B' vaccination. As reason professional education may be emphasised for the health workers in the laboratory, which also is most likely to solve as an effective tool in controlling the professional injuries (Attaullah et al., 2011). To combat the highly infectious 'Hepatitis-B' infection amongst the laboratory personnel this vaccination should be mandatory (Plotkin et al., 2011). A specific approach by the government authority for 'Hepatitis-B' vaccination to all categories of laboratory workers may be undertaken to prevent the chances of LAI. Laboratory staff immunized with 'Hepatitis B' vaccine showed a higher percentage in both government and private sector in 'Burdwan' district as the out come of better health awareness of individuals in that district. Seminar or workshop in medical colleges and paramedical colleges as well as participation of laboratory technologists in those seminars in 'Burdwan' district may be one the causes in this concern. Provision of this immunization should be created from the government side and must be needed as a step for controlling the LAI from the highly infectious diseases (Figure 11). From Table 11 and Table 12 it was evident that public supply of electricity was provided in all the government laboratories in both the districts. In private sector said facilities were also more enjoyed. A few laboratories in private sector set up their own additional arrangement in this concern. Public water supply were provided more in number in government sector laboratories of 'Hooghly' district, where as in 'Burdwan' district in government sector public supply and own additional arrangement were equal. In this district public water supply was not extended everywhere particularly in rural area. Alternative own arrangement for power supply in government sector laboratories are suggested to maintain the continuous cold chain for preservation of the reagents, test kits and biological samples etc., which may be affected by disrupted power supply. This may cause gross variation of results and reproducibility of the test generated by the government laboratories. Due to having own additional resource of water and power supply public sector laboratories was habituated to generate a diagnostic report earlier than in government sector. Patient community depended more on the private sector laboratories to obtain early reports which is not feasible in government sector. For accreditation of the laboratories own arrangement for power and water resources are essential as the test procedure should not be hampered during processing of samples to obtain a quality report. Additional own arrangement should be developed in every diagnostic laboratories (Godkar and Godkar 2005; Nareja and Reiss, 2015). Insignificant inter district comparative data were obtained for power supply system in the private sector laboratories in two districts. Additional own system is suggested to increase the laboratory facilities with reproducible and reliable test results in time. Continuous power supply should be assured for all the laboratories in government and private sectors (Figure 12 and Figure 13).

5. Conclusion

It is evident from this experiment that the diagnostic laboratory facilities are available more in urban area than in rural area in two districts. The number of such service provider is higher in private sector than in government sector. As per financial capability of the owners of the laboratories in private sectors the establishments are equipped. If there is provision of financial assistance from the controlling authority (i.e. Dept. of Health of the State or National Government) to the laboratories for infrastructural development, more services could be provided with moderate fees to the patients. Rushes of patients in the government laboratories will be automatically diminished and at the same time they will serve with a reproducible laboratory reports to the medical practitioners in time. Regarding bio-safety and biomedical waste management of the private sector laboratories the fees charged by the agencies become a burden for the small size laboratories. The district health authorities may think for alternative or subsidized rate for bio medical waste management for the small laboratories.

6. References

i. ORGI (Office of the Registrar General India). (2011). Ministry of Home Affairs, Government of India, New Delhi. Sample Registration System Statistical Report. Report No. 1 of 2013, Pp.2-85.
ii. MOH (Ministry of Health). (2007). National Strategic Plan for Laboratories 2008-2012. Laboratory Services National Strategic Plan. 2:1-42.
iii. NABL (National Accreditation Board for Testing and Calibration Laboratories). (2008). Electro–Technical Calibration services in India. Specific criteria for accreditation of medical laboratories. NABL-112(3). Ahmedabad, India, Pp. 1-45.
iv. Das, B., Sanyal, S., Dasgupta, S. (2002). A profile of manpower of the pathological laboratories in the district of Midnapore, West Bengal, India. Med Tech. 13:16-19.
v. Setia, S., Gambhir, R.S., Kapoor, V., Jindal, G., Garg, S., Setia, S. (2013). Attitudes and Awareness Regarding Hepatitis B and Hepatitis C Amongst Health-care Workers of a Tertiary Hospital in India. Ann Med Health Sci Res. 3:551-558.
vi. Patil, S., Rao, R.S., Agarwal, A. (2013). Awareness and risk perception of hepatitis B infection among auxiliary healthcare workers. J Int Soc Prev Comm Dent. 3:67-71.
vii. SEMP (Sembramky Environmental Management Pvt. Ltd.).(2005). Detailed Project Report (SREMPL/CBMWTF/CHM/BIADA/PAT/12) with Specifications for Development of Integrated Bio-Medical Waste Management Facility in Patna & Surrounding areas. 1-20.
viii. Jha, A.K., Chadha, .S, Bhalla, P., Saini, S.V. (2012). Hepatitis B Infection in Microbiology Laboratory Workers: Prevalence, Vaccination, and Immunity Status. Hepatitis Res Treat. 2012:1-5.
ix. Das, B., Dey, T.K., Sanyal, S., Dasgupta, S. (2001). A profile of manpower engaged in pathological laboratories in the district of Hooghly, West Bengal. AIMLTA Chronicle. 4:7-11.
x. Ciorlia, L.A.S., Zanetta, D.M.T.(2005) Hepatitis B in healthcare workers: prevalence, vaccination and relation to occupational factors. Brazilian J Infect Dis. 9:384–389.
xi. Garner, J.S. (1996). Hospital Infection Control Practices Advisory Committee. Guideline for isolation precautions in hospitals. Infect Control Hosp Epidemiol. 17:53-80.

xii. Hadadi, A., Afhami, S., Karbakhsh, M., Esmailpour, N. (2008). Occupational exposure to body fluids among healthcare workers: a report From Iran. Singapore Med J. 49:429-432.

xiii. Attaullah, S., Siraj, S., Khan, S., Ayaz, N.S., Khan, S.N., Ali, I., Hoti, N. (2011). Prevalence of HBV and HBV vaccination coverage in health care workers of tertiary hospitals of Peshawar, Pakistan. Virol J. 8: 275-278.

xiv. Plotkin, S., Leuridan, E., VanDamme, P. (2011). Hepatitis B and the need for a booster dose. Clin Infect Dis 53:68–75.

xv. Godkar, P.B., Godkar, D.P. (2005). Textbook of Medical Laboratory Technology, 2nd Ed., Bhalani Publishing House, Mumbai, Pp. 245-386.

xvi. Nareja, R.F., Reiss, D.R. (2015). First do no harm: protecting patients through immunizing health care workers; legal studies research paper series, Research Paper No. 136. Health Matrix: J Law Med. 26:1-49.

xvii. Mustafa, A., Jan, F.A., Qadri, G.J., Tabish, S.A. (2008). Safety in laboratories: Indian Scenario. Int J Health Sci 2:112-117.

xviii. NIC (National Informatics Centre). (2008). Directory of District, Sub division, Panchayat Samiti/ Block and Gram Panchayats in West Bengal, India, Pp.1-19.

xix. Malone, J.L., Ijaz, K., Lambert, L. (2004). Investigation of healthcare-associated transmission of Mycobacterium tuberculosis among patients with malignancies at three hospitals and at a residential facility. Cancer. 101:2713-2721

xx. Kranzler, J.H., Moursund, J. (2007). Statistics for the Terrified, 4th Ed., Prentice Hall, USA, 1-260.

xxi. GWB (Government of West Bengal). (1952). West Bengal Act LVI of 1950 or the clinical establishment act, 1950 and the West Bengal Clinical Establishment Rules 1951.Calcutta Med J. 49:280-282.