

Research Article**Effective Demand (Utilization) of Laboratory Services of a Tertiary Care Hospital****Malik Aubid¹, G J Qadri², Mushtaq A Siddiqui³, Farooq A Jan⁴, Shahnawaz Hamid⁵**¹Senior Resident, Hospital Administration, SKIMS, Soura, Srinagar, Jammu and Kashmir, India²Ex- HOD, Department of Hospital Administration, SKIMS, Soura, Srinagar, Jammu and Kashmir, India³Ex- HOD, Department of Immunology, SKIMS, Soura, Srinagar, Jammu and Kashmir, India⁴HOD, Department of Hospital Administration, SKIMS, Soura, Srinagar, Jammu and Kashmir, India⁵Senior Resident, Hospital administration, SKIMS, Soura, Srinagar, Jammu and Kashmir, India***Corresponding author**

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Abstract: The increasing costs of medical care mandate that those in Clinical laboratories and their Clinical colleagues be concerned as well with effective utilization of Laboratory services in medical care. Utilization of Laboratory services has increased during the last several decades in many health care jurisdictions. Utilization of services or actual coverage is expressed as the proportion of people in need of a service who actually receive it in a given period, usually a year. A. retrospective study for a period of five years. B. prospective study for a period of one year was carried out. Methods included were 1. Observational study. 2. Records. The results were retrospective analysis to study the utilization of laboratory services at SKIMS revealed that a total of 7.36305 investigations were ordered for the period of study. There was a progressive increase in quantum of tests ordered per year for the period of study. Utilization per bed per day for the entire period worked out to be 0.886. Utilization of laboratory investigations per bed per year, viz – a viz various medical and surgical revealed that critical care areas ordered highest number of tests per bed per day having a utilization of 26.58 followed by Nephrology(4.46) and Emergency medicine (4.14). Utilization of laboratory services viz-a-viz type of tests ordered that Arterial Blood Gas ranked highest 138/bed/year followed by electrolytes 112/bed/year. Utilization was lowest for amylase 5.72/bed/year.**Keywords:** Laboratory services, Investigations, Utilization Cardiovascular disease

INTRODUCTION:

The discipline of Laboratory medicine can be viewed as a bridging endeavor linking the basic medical, biological, and physical science with medical practices. The bridge between the basic science and Clinical Medicine is buttressed by essential support derived from equipment, reagents, computer, management technique and quality assurance approaches provided by industry [1].

The efficient operation of a Clinical Laboratory and the effective delivery of medical Laboratory services to clinicians and their patients require a complex interdigitation of expertise in medical, scientific and technical areas; of resources in the form of personnel, laboratory, and the data processing equipment, supplies, and facilities, and of skills in organization, management, and communication. Laboratory directors and supervisors must also be aware of the many accreditation standards and governmental regulations that apply to Laboratory practice and must ensure quality laboratory performance. The increasing costs of medical care mandate that those in Clinical laboratories and their Clinical colleagues be

concerned as well with effective utilization of Laboratory services in medical care [1]. Utilization of Laboratory services has increased during the last several decades in many health care jurisdictions [2]. Utilization of services or actual coverage is expressed as the proportion of people in need of a service who actually receive it in a given period, usually a year [3].

It is often assumed that some of this is inappropriate, although the evidence supporting this supposition is weak [4]. Interventions to improve laboratory utilization include physician's education, laboratory requisition form changes, and policies concerning laboratory test ordering studies have concluded that educational interventions have mixed effects on laboratory test use [5].

Laboratories management must know the services that all being provided, their true costs, and the revenue that will support these services [6]. Clinical laboratories must be efficient, cost effective, high quality producers of

diagnostic data that aid in the diagnosis and treatment of disease [7].

A bench mark of all good, reliable Clinical laboratories is the ability to produce accurate analyses on Clinical specimens in a timely manner in a safe and pleasant work environment. Laboratory safety does not happen; it is the end result of everyone who works in the Laboratory. Laboratory safety must be a part of ongoing in-house continuing education program with the Laboratory's safety manuals the focus for discussion, improvement, and necessary implementations with a positive approach to safety and good health for entire staff, the Clinical Laboratory can become the model for safety and health in the work place for the entire institution [8].

METHODOLOGY

Sheri-i-Kashmir institute of medical sciences (SKIMS) established in 1982 besides teaching and research, offers quality medical services in various surgical and medical super specialties. The institute for purpose of patient care services has a modern Hospital having about 575 beds with all required Clinical, engineering and support services. The institute has a strong back up of specialized laboratories which include Clinical biochemistry, hematology, immunology and molecular medicine, microbiology including Parasitology, Clinical pharmacology and Clinical pathology. In addition to departmental laboratories SKIMS Hospital has a central Laboratory located at ground floor of the Hospital building. It caters to departments of emergency medicine, outpatient and inpatient departments and provide service for 24hrs x 365 days [9].

Utilization of central Laboratory per Hospital bed and per Hospital discharge specialty wise was attempted. The departments included were:

- i. Emergency Medicine
- ii. Anesthesiology and critical care.
- iii. Cardiology
- iv. Cardiovascular Thoracic Surgery
- v. Endocrinology

- vi. Gastro-Enterology
- vii. General Medicine
- viii. General Surgery
- ix. Medical Oncology
- x. Neonatology
- xi. Nephrology
- xii. Neurology
- xiii. Neurosurgery
- xiv. Pediatric Surgery
- xv. Plastic Surgery
- xvi. Radiotherapy (Radiation Oncology)
- xvii. Surgical Gastroenterology
- xviii. Urology

Utilization of central Laboratory was determined by using the following methodology.

(A) Retrospective Study:

A Retrospective study of five years (Jan 2002 – Dec 2006) was undertaken to study the utilization of central Laboratory at SKIMS. The study period of five years (Jan 2002 to dec 2006) was taken because the period was relatively less disturbed in Kashmir valley. The methodology used included. (AI) The study of available records in the central Laboratory, medical records and other related departments. (AII) information was supplemented by interaction with staff posted in central Laboratory, medical records officer and medical superintendent of Hospital.

(B) Prospective Study

A prospective study of one year was carried out. The study encompassed collection of data regarding utilization of Laboratory services using the following methods.

(BI) Observational Study: included daily collection of data regarding workload in the central Laboratory by direct observation by the researcher. The data collected was entered on the checklist.

(B2) Records: The data obtained through the observational study was supplemented and cross checked with the daily records, requisition slips/registers/report register etc. maintained in the central Laboratory.

$$\text{Av. No. of investigations/deptt./month} = \frac{\text{Specialty wise utilizations/bed/day}}{30 \times \text{Beds occupied/day at Average monthly BOR for that department}}$$

$$\text{BOR: Bed occupancy rate} = \frac{\text{Av. Daily census}}{\text{Bed compliment}} \times 100$$

The specialty wise bed compliment of institute was obtained from MRD records.

Specialty wise utilization of central laboratory services per bed per year was calculated for one year by using the formula.

$$\text{Specialty wise utilization/bed/year} = \frac{\text{Average no. of investigations/dept./month.}}{\text{Beds occupied at Av. Monthly BOR for that dept.}} \times 12$$

Since the Emergency Medicine beds are not included in the bed complement, to overcome this

fallacy utilization of investigations was calculated per discharge per dept, using the formula.

$$\text{Utilization/100 discharges} = \frac{\text{Av. No. of investigations/dept./month}}{\text{Av. discharges for that dept./month}} \times 100$$

RESULTS

To study ‘Utilization’ of the central Laboratory a retrospective study for a period of five years and a prospective study for one year was undertaken. Retrospective study revealed a total of 7, 36305 investigation were analyzed in the Laboratory during the period. The year wise distribution of the test performed (Fig.1) showed a progressive increase in the number of tests performed during the years of study,(i.e. 112,264 in 2002, 122296 in 2003, 146278 in 2004, 154550 in 2005 and 2,00917 in 2006). The utilization of laboratory investigations studied in terms of per bed per day (Fig. ii) revealed that there was an increasing trend in the number of tests per bed per day during the period of study. The utilization per bed per day for the entire period of study worked out to be 0.886. Year wise distribution of utilization per bed per day was 0.661 in 2002, 0.696 2003, 0.832 in 2004, 0.994 in 2005 and 1.198 in 2006.

Utilization was also studied in terms of per hundred patients discharged from the hospital (Fig.III) and the finding for the variable worked out to be 439.08 for year 2002 ,449.69 for 2003; 472.84 for 2004, 515.16 for 2005 and 588.5 for the year 2006.

Utilization was also studied by a prospective study and the prospective study revealed that a total of 297819 lab investigations were performed during the period of study. Classifications of laboratory investigations into two board specialties of biochemistry, and hematology & Allied specialty (Fig.IV) revealed that out of total of 297819 investigation 77.59%(n=231095) constituted of biochemistry while 22.4%(n=66724) constituted Hematology and allied specialty. Effective

demand/utilization in terms of per bed, per day revealed (fig.V) that critical areas had again highest utilization (26.58) in comparison to other areas. Specialized areas like Emergency medicine also had a utilization of 4.14 per bed day. Neurosurgery had lowest utilization 0.33 per bed per day.

Utilization of lab investigations per bed per year specialty wise was highest (9572.31) for critical care units (i.e., SICU’s MICU POW) followed by Nephrology (1605.72), Emergency Medicine (1493.8) and Neonatology (1316.55). The utilization per bed per year for rest of the specialties was in the range of 115.86 to 852.012.

Utilization per bed per month revealed similar trend with critical care area making maximum use of lab investigation 797.66 followed by Nephrology 133.81, Emergency medicine 124.48 neonatology 109.71.

Utilization in terms of type of Laboratory investigation revealed (fig.vi) that Arterial blood gas (ABG) ranked highest (138/bed/years) followed by Electrolytes (112/bed/year), blood glucose 68.4/bed/years. Utilization was lowest for amylase 5.72/bed/year. The monthly and daily utilization for various types of investigation showed similar pattern as yearly data.

Seasonal trend in utilization (Fig. vii) for the prospective study revealed that utilization/bed/month was highest for spring (61.78) followed by summer 565.25/bed/month, winter 41.61 and autumn 41.08/bed/month.

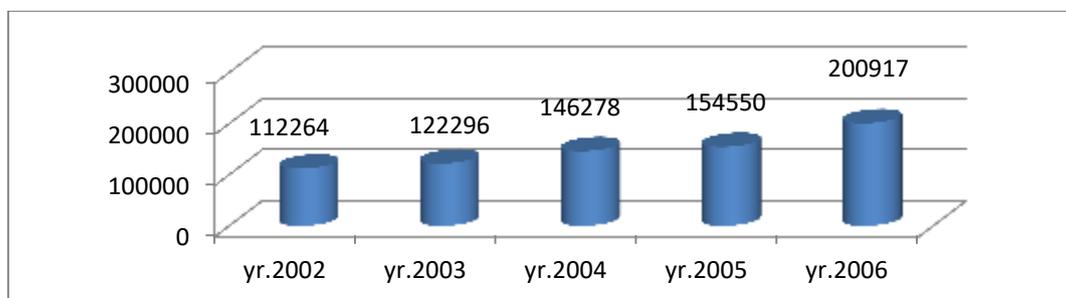


Fig 1: Yearly distribution of number of tests

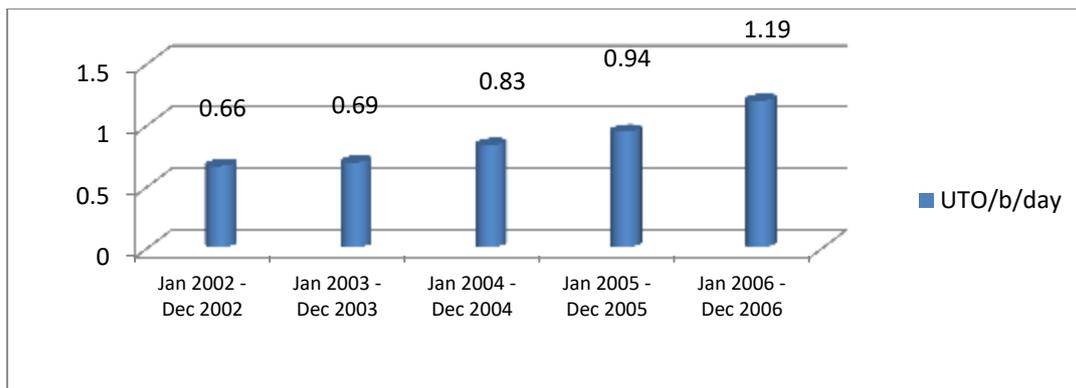


Fig. 2: Utilization of laboratory tests/bed/day

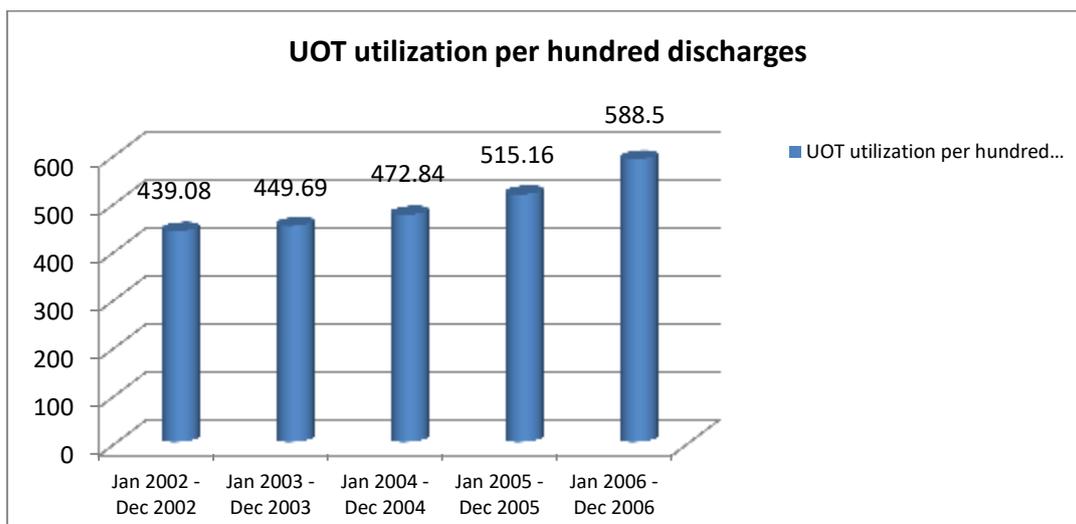


Fig. 3: Utilization of Laboratory tests/hundred discharges

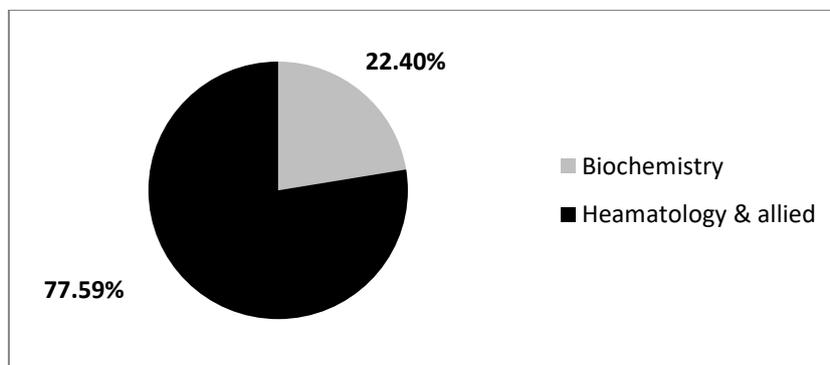


Fig 4: Laboratory investigation viz a viz (Biochemistry and Hematology & allied)

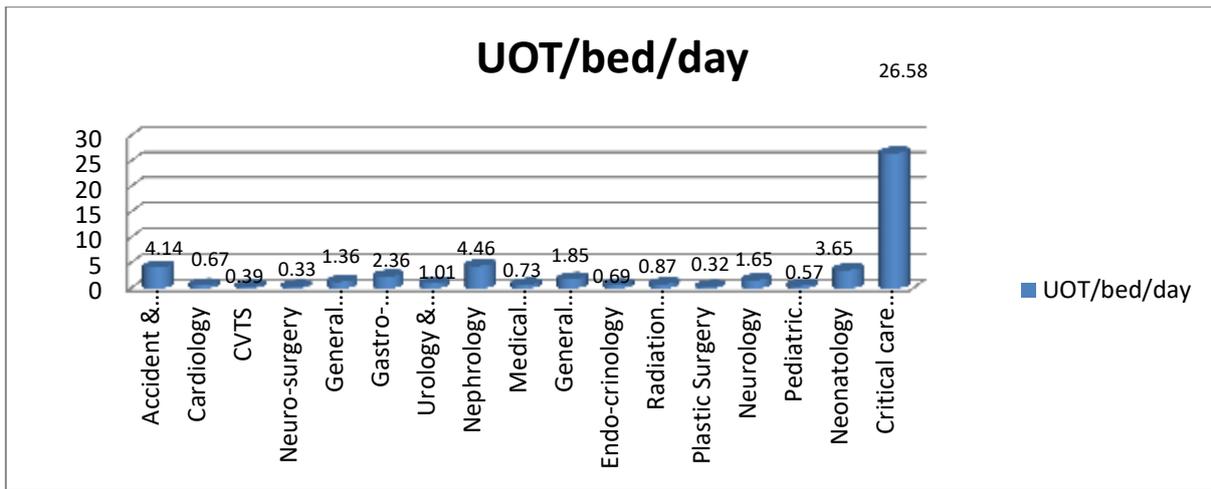


Fig 5: Utilization of Laboratory tests/bed/day viz a viz clinical specialty

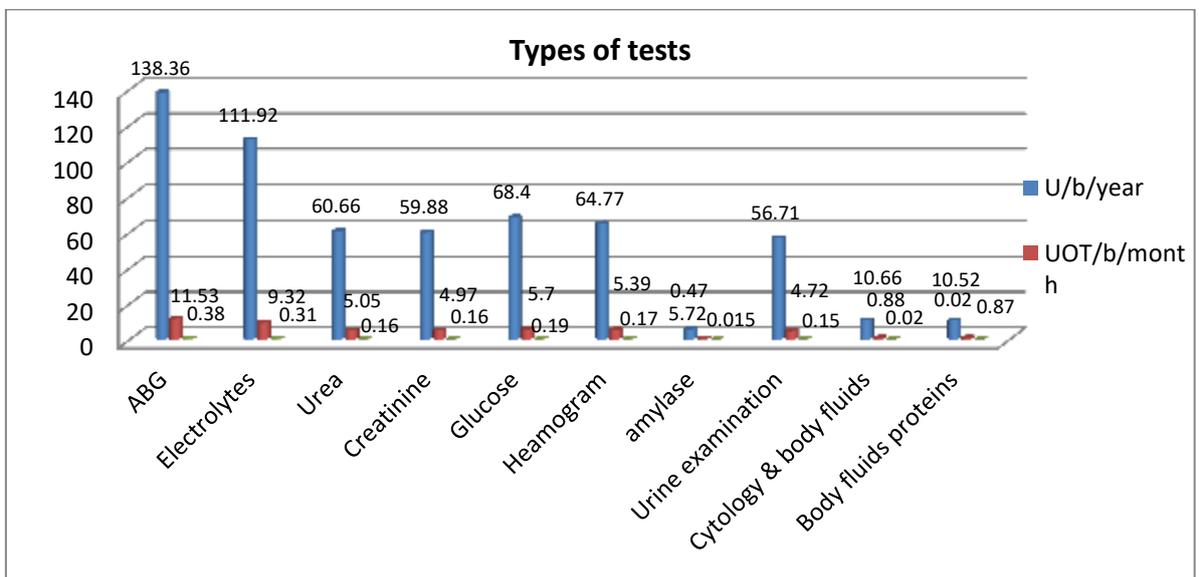


Fig 6: Utilization of Laboratory investigation viz a viz types of test

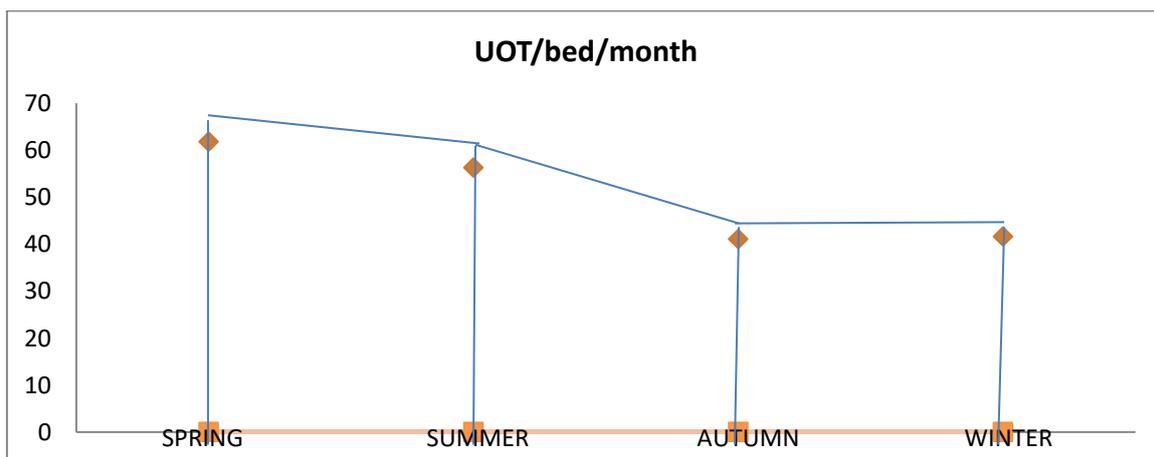


Fig 7: Seasonal trends in utilization of laboratory tests

DISCUSSION

In the past 30 years Clinical and Laboratory medicine have experienced tremendous developments and subsequently have undergone dramatic changes.

Many of the developments have evolved from research which produced medical discoveries at an unprecedented rate. The Clinical Laboratory has responded to these discoveries by introducing many

new and sophisticated techniques. This has resulted in our Clinical colleagues requesting a greater number and variety of Laboratory determinations. In turn, Clinical Laboratory professionals have been forced to devote most of their time and effort to the implementation of automation and in some instances, computerization to meet the demand for more Laboratory results in a shorter period of time [10].

Retrospective analysis to study the utilization of Laboratory services at SKIMS revealed that a total of 7, 36305 investigations were ordered for the period of study. There was a progressive increase in the quantum of tests ordered per year for the period of study. Reddy KVR *et al.*; established that in hundred bedded Hospital with an ALS of 10 days will appropriately carry out 29600-74000 test per year [11].

Research by Carl Van Walraven *et al.*; to study the effect of provider continuity on test repetition observed that 1419438 index Laboratory tests were ordered for 881353 patients during the study period [13]. Utilization per bed per day for the entire period worked out to be 0.886.

Utilization of Laboratory investigations per bed day revealed an increase in the number of tests during the period of study. Yearly and monthly utilization of Laboratory investigations per bed followed the same trend as utilization per bed per day i.e. a progressive increase in the utilization of Laboratory during the years of study. In line with these findings Carlvan Walraven reports of population based interventions on Laboratory utilization revealed that there was a progressive increase in the number of Laboratory test 9.4 – 17.4 tests per person between 1976 and 1993 [13].

The Retrospective observation of the study revealed that utilization per hundred discharges worked out to be 439.88 for 2002, with a progressive increase to 588.5 for 2006, showing an increasing trend during the period of study. Study by Macmillan D *et al.*; on analysis of reference Laboratory (sending out) testing an 8 years experience in a large academic medical center, showed that reference Laboratory test volume increased four-fold to 68,328 tests in FY 2002 [14].

Utilization of Laboratory per bed per year, viz-a-viz various medical and surgical specialties revealed that critical care areas ordered highest number of tests per bed per day having a utilization of 26.58 followed by nephrology 4.46 and Emergency Medicine 4.14. Research by Gutterman S.J *et al.*; reveals automated full blood count as one of the commonly requested tests, by high user department such as Emergency Medicine and intensive care units [15].

Utilization of Laboratory services viz-a-viz type of tests ordered revealed that Arterial Blood Gas ranked highest 138/bed/year followed by electrolytes 112/bed/year. Utilization was lowest for amylase 5.72/bed/year.

This observation again results due to high utilization of these Laboratory investigations in critical care areas as ABG and electrolytes being the commonest investigations ordered in these areas. G.Gopal Roa *et al.*; reports that serum electrolytes and blood gases have been shown to be the most frequent “over requested” tests [16].

Seasonal trend in utilization revealed that utilization per bed per month was highest for spring 61.78 followed by summer 56.25, winter 41.61 and autumn 41.08. This observation can be explained by the bed occupancy rates for these seasons, which are usually in consonance with the utilization trends.

CONCLUSION

Retrospective analysis to study the utilization of laboratory services at SKIMS revealed that a total of 7.36305 investigations were ordered for the period of study. There was a progressive increase in quantum of tests ordered per year for the period of study. Utilization per bed per day for the entire period worked out to be 0.886. Utilization of laboratory investigation per bed per day revealed an increase in the number of tests during the period of study. Yearly and monthly utilization of laboratory investigations per bed followed the same trend in the utilization of laboratory tests during the years of study. The retrospective observations of the study revealed that utilization per hundred discharges worked out to be 439.88 for 2002, with a progressive increase to 588.5, showing an increasing trend during the period of study. Prospective study revealed that total of 297819 laboratory tests were performed for the period of study 77.59% of the total were biochemical tests while 22.4% were hematological and allied investigations.

Utilization of laboratory investigations per bed per year, viz – a viz various medical and surgical revealed that critical care areas ordered highest number of tests per bed per day having a utilization of 26.58 followed by Nephrology (4.46) and Emergency medicine (4.14). Utilization of laboratory services viz-a-viz type of tests ordered that Arterial Blood Gas ranked highest 138/bed/year followed by electrolytes 112/bed/year. Utilization was lowest for amylase 5.72/bed/year. Seasonal trend in utilization revealed that utilization bed/month was highest for spring (61.78) followed by summer (56.25), winter (14.61) and autumn (41.08).

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