A DISSERTATION ON

"PORTSMOUTH POSSUM SCORING SYSTEM IN GENERAL SURGICAL PRACTICE AND IDENTIFYING RISK FACTORS FOR LOW OUTCOME IN GASTROINTESTINAL SURGERIES"

Dissertation submitted to

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI

In partial fulfillment of the requirement for the degree of

M.S. DEGREE IN GENERAL SURGERY

BRANCH – I

MADRAS MEDICAL COLLEGE &

RAJIV GANDHI GOVERNMENT GENERAL HOSPITAL,

CHENNAI – 600 003

CERTIFICATE

This is to certify that the dissertation titled

"PORTSMOUTH POSSUM SCORING SYSTEM IN GENERAL SURGICAL PRACTICE AND IDENTIFYING RISK FACTORS FOR LOW OUTCOME IN GASTROINTESTINAL SURGERIES"

is the original work done by **Dr.D.ARUN**, post graduate in M.S., General surgery at the department of general surgery, Madras Medical college, Chennai 600003 to be submitted to the Tamilnadu Dr.M.G.R Medical university, Chennai 600 032, towards the partial fulfillment of the requirement for the award of M.S.,degree in General Surgery during the academic period from May 2010 – April 2013.

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DECLARATION

I solemnly declare that the dissertation titled **"PORTSMOUTH POSSUM SCORING SYSTEM IN GENERAL SURGICAL PRACTICE AND IDENTIFYING RISK FACTORS FOR LOW OUTCOME IN GASTROINTESTINAL SURGERIES"**

was done by me at Rajiv Gandhi Government General Hospital, Chennai-600003 during the period of July 2012 to December 2012 under the guidance and supervision of Prof. K.Ramasubramanian M.S.,

The dissertation is submitted to the Tamil Nadu Dr.M.G.R Medical University, Chennai towards the partial fulfillment of the requirement for the award of **MS Degree in General Surgery Branch –I**

Dr.D.ARUN

Place :

Date :

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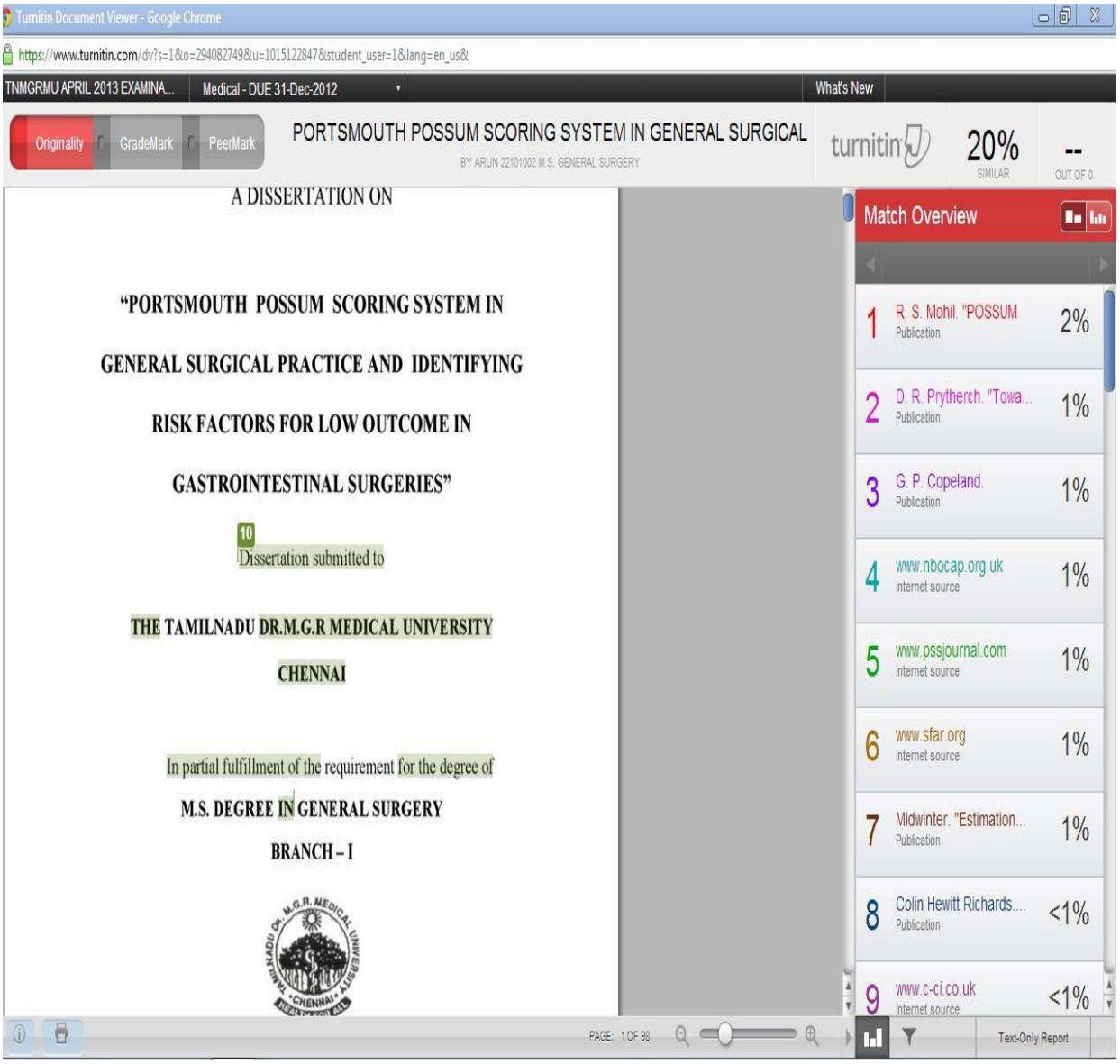
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“PORTSMOUTH POSSUM SCORING SYSTEM IN GENERAL SURGICAL PRACTICE AND IDENTIFYING RISK FACTORS FOR LOW OUTCOME IN GASTROINTESTINAL SURGERIES”

ABSTRACT

Background and objectives:

The Physiological and Operative Severity Score for the enumeration of mortality and morbidity (POSSUM) and its modification the Portsmouth POSSUM, have been proposed as a method for standardising patient data so that direct comparisons can be made in spite of differing patterns of referral and population. Application of the POSSUM scoring system in this country where the level of healthcare and resources differ, is limited. In this prospective study, the validity of P-POSSUM was tested in patients undergoing major surgery and the risk factors for low outcome were noted.

Methods:

Some 100 major gastrointestinal surgeries, as defined by the POSSUM scoring system criteria were studied. Predicted mortality rates were calculated using the P-POSSUM equation by linear analysis method. It was then compared with the actual outcomes. The risk factors as scored in the POSSUM criteria were noted.

Results:

Applying linear analysis, an observed to expected ratio of 0.96 was obtained, indicating a significant fit for predicting the post operative adverse outcome. There was no significant difference between the observed and predicted mortality rates ($x2 = 1.667$, 9 d.f., P = 0.9957). It was found to be comparable to other studies. In all the risk factors studied, a positive correlation was found between deaths and higher POSSUM scores.

Interpretation and Conclusion:

Portsmouth POSSUM scoring system serves as a good predictor of post operative outcome in major general surgical procedures and was applicable even in our setup and be used for comparing various treatment modalities and assessing the quality of care provided.

Key words:

POSSUM; surgical scoring; mortality**.**

LIST OF ABBREVATIONS USED

APACHE II – Acute Physiology and Chronic Health Evaluation

ASA – American Society of Anaesthesiologists

COAD – Chronic Obstructive Airway Disease

POSSUM - Physiological and Operative Severity Score for the Enumeration of mortality and morbidity

ROC – Receiver Operator Characteristic

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INTRODUCTION

The basic aim of any surgical therapy is to cause reduction in morbidity and mortality rates. It is done by comparing the influence on adverse outcome. we can assess the efficiency of any particular procedure and assess the quality of care provided to the patient. But by comparing crude morbidity and mortality rates is fallacious, because differences in general health of the local population and variable presentation of the patient's condition highly influence them.

Risk scoring tends to quantify a patient's risk of adverse outcome based on the severity of disease derived from data pre operatively.The possible outcome of a surgical operation must be determined, to formulate more effective treatment regimens. Therefore, there is a need for an accurate risk scoring system, which should be specific to the patient being studied, and should incorporate

- The influence of the diagnosis for which he is being subjected for surgery

- whether elective or emergency
- allow for assessment of variable presentation
- to allow assessment of the efficiency of the particular procedure performed.

It should also, be easy to use, fast, and comparable among different patient groups.Such a scoring system would allow for comparison of quality of care provided. It could be used to help set a benchmark acceptable adverse outcome rate for a particular procedure, by comparing the mortality rates at different centres.It would also allow for comparison of efficacy of various procedures by comparing the differences in observed to expected mortality rates.It would result

in a better and meaningful surgical audit and also help in adaptation of newer procedures by comparing the reduction in the observed to expected adverse outcome rate.It could be used in predicting the individual patient's prognosis, and influence treatment decisions and help in rationalising regimens.

The Physiological and Operative Severity Scoring system for the enUmeration of Morbidity and mortality (POSSUM) has been proposed as a risk adjusted scoring system to allow for direct comparison between the observed and expected adverse outcome rates. Hence it has been called as a surgeon based scoring system.

The Portsmouth POSSUM is a modification of the POSSUM scoringsystem, incorporating the same variables and grading system, but a different equation, which provides a better fit to the observed mortality rate, which is an important and objective measure of outcome7, 8. It has been widely used in various surgical specialities but the studies mostly involved patients in developed countries, where the patient characteristics, presentation and available resources differ from our setup.Hence, there is a need to test the validity of P-POSSUM scoring system in the Indian scenario where malnourishment is a common problem, presentation frequently delayed and resources limited, all of which can influence the patient's complication rate, even with adequate quality of care provided. Hence, the scoring system should be able to incorporate these factors to predict an accurate mortality rate.

The P-POSSUM scoring system, which includes both physiological and operative finding parameters, has been proposed to address these concerns.Therefore, there is a need to test whether the P-POSSUM scoring

system is able to effectively address these concerns while arriving at the expected mortality rate

in the Indian scenario.Major surgeries (elective and emergency), as defined by the POSSUM scoring system, constitute the important high risk group of patients where, the comparison of observed to expected mortality rate would be expected to yield significant results and, determination of the possible causes for the adverse outcome in patients who succumb following the surgical procedure, would be

more beneficial.

This study was undertaken to assess the validity of P-POSSUM scoring system in patients undergoing major surgeries in our setup and, to try to analyse the causes for low outcome in this high risk group.

OBJECTIVES

1. To assess the validity of Portsmouth POSSUM scoring system in predicting anticipated mortality rate and to compare with the actual mortality rate in general surgical patients admitted for major surgical procedures in Rajiv Gandhi Government General Hospital, Chennai-03.

2. To assess validity of Portsmouth POSSUM scoring system in identifying risk factors for adverse outcome.

REVIEW OF LITERATURE

Copeland G P5 analysed 62 individual parameters (48 physiological and 14 operative factors) over a 6 month period to reduce the number of variables in an effort to create a simple, surgeon based risk adjusted scoring system. Of these, 35 factors were further studied over a 6 month period to produce the final set of 12 physiological and 6

operative factors. Multivariate discriminate analysis was then done to obtain multivariate discriminate function coefficients for each set of variables to produce a 12 factor, 4 grade physiological score and logistic regression analysis was done to derive a 6 factor, 4 grade

operative score.

It was then applied prospectively in 1,372 patients undergoing general surgeries using logistic regression analysis to obtain statistically significant equations.

Physiological score (12-88), Operative score (6-48)

For morbidity it was,

Loge [R/1-R] = - 5.91 = (0.16 x physiological score) + (0.19 x operative score)

Where R = risk of morbidity.

For mortality it was,

Loge [R/1-R] = - 7.04 + (0.13 x physiological score) + (0.16 x operative score)

Where R= Risk of mortality.

The predictive value of these equations was assessed and validated by the determination of receiver operating characteristic curves. They concluded by suggesting wider application of the scoring system to assess its validity in other surgeries and different setups. Jones D R23 compared the efficiency of POSSUM and APACHE II scoring systems, in predicting the adverse outcome in 117 patients in a general surgery unit, undergoing major surgery (elective and emergency). Preoperative and intra operative data was collected and patients were monitored for any complications for the first 30 postoperative days. 13 patients (11%) died and the incidence of post operative complications was 50%. ROC curve analysis was

performed to calculate predictive value of POSSUM and APACHE II scoring systems. POSSUM was a good predictor of mortality (area under curve 0.753) and morbidity (area under curve 0.82). APACHE II scoring system showed a poor predictive value (area under curve 0.54) and a statistically significant difference was seen ($p < 0.002$).Therefore, POSSUM scoring system was recommended as

an accurate predictor of post operative adverse outcome.

Copeland G P2 applied POSSUM for comparative audit in 344 patients undergoing reconstructive vascular surgery to assess its efficiency in

comparative audit between two units. They were able to demonstrate that POSSUM was a better predictor of adverse outcome following surgery. Estimated mortality rates of 10.2% for unit A (observed 9.4%) and 20.2% for unit B (observed 20.2%) were

obtained and using ROC curves they proved that there was no statistically significant difference between the two units. They concluded that POSSUM scoring system was a better guide for comparing efficiency of quality of care, rather than crude mortality rates. Copeland G P6 analysed the basis of comparative audit and suggested POSSUM scoring system to help fulfil the basic need of providing good comparative audit from general surgical patients.

Sagar P M1 evaluated feasibility of POSSUM scoring system for

predicting adverse outcome rate following colorectal resection and its use for comparative audit. 248 patients undergoing colorectal resection in two different units were studied and POSSUM scoring system was applied. POSSUM predicted mortality rate of 5.2% in unit A (observed 6%) and 9.8% in unit B (observed 9%) denoting that the observed to expected ratio were nearly identical both the units.

Therefore, they concluded by validating POSSUM scoring system in patients undergoing colorectal surgery and also it's efficacy in comparative audit.

Murray G D3 suggested that statistical remodelling is required for

predicting the quality of care and, comparison using crude mortality rates was not a good method.

Whitely MS7 from Portsmouth University evaluated POSSUM scoring system in 1,485 patients undergoing general surgical procedures. Mortality rate was used to compare the observed and expected rates because of difficulties involved in defining morbidity and collecting data on complications. Mortality is also an objective measure of surgical outcome. The predicted deaths were 90, while the observed deaths were 37. They demonstrated an over prediction of by a factor of 2 using the POSSUM scoring system and linear analysis as described by Hosmer and Lemeshow. Therefore, in order to improve the predictive capability of the scoring system, they used linear regression analysis to derive a better equation, but using the same set of variables as described in the original POSSUM scoring system.

For mortality it was,

Loge [R/1-R] = (0.1692 x PS) + (0.155 x OS) - 9.065.

Where R = risk of mortality.

The new modified Portsmouth POSSUM scoring system was then created, which provided a better fit to the observed mortality rate (O: E ratio 1, *x2* test 5.84 ,d.f., p = 0.1197).They concluded by suggesting geographical comparison of POSSUM, which could result in better application of risk adjusted scoring system as was done in their case.

Wijesinghe10 compared POSSUM and Portsmouth POSSUM (P -POSSUM) for predicting mortality following vascular surgery in 312 consecutive patients. Data regarding the first 30 day post operative period was collected, which

revealed 41 deaths. Analysis was done using linear and exponential methods for POSSUM and P-POSSUM, respectively. Using the POSSUM scoring system they obtained an observed to expected ratio of 0.59 using linear analysis and 1.14 using exponential analysis. P-POSSUM revealed an observed to expected ratio of 0.89 using linear analysis, which was simpler and could predict the individual patient's mortality rate. They concluded that POSSUM and P-POSSUM are accurate in predicting the mortality rate if the correct method of analysis was used for each system and the scoring systems were valid not only in general but also in vascular surgery. Prytherch D R8 prospectively compared POSSUM and P-POSSUM in 10,000 general surgical patients between August 1993 and November 1995. The POSSUM scoring system was applied to all 10,000 patients, while the first 1,500 patients were used to derive a modified P-POSSUM equation, which was then

applied prospectively to the remaining cases. While the POSSUM scoring system over predicted the mortality rate by a factor of 2, the observed mortality rate being 287 deaths and predicted was 697 deaths, the P-POSSUM scoring system when applied prospectively on the subsequent 7,500 cases showed an observed to expected ratios of 0.90 ($x2$ =1.63 5 d.f.,) and 0.85 ($x2$ =1.35 4 d.f.).They concluded

by suggesting application of P-POSSUM scoring system for predicting mortality and also emphasised the need for evaluation of geographical variation in predicting the adverse outcome rate.

Jones H J S and de Cossart L4 performed a Meta analysis of the various scoring systems available for risk scoring in surgical patients by comparing ASA, Goldman cardiac index, prognostic nutritional index, hospital prognostic index, APACHE II, POSSUM and P-POSSUM scoring systems. They suggested that POSSUM and P-POSSUM scoring systems could be used because of their easy

applicability, usage of routine preoperative investigations and could serve as an important risk scoring tool.

Midwinter11 compared POSSUM and P-POSSUM for assessing mortality and morbidity rates in patients undergoing vascular surgery. 221 patients undergoing elective and emergency vascular surgeries by a single consultant were studied. Overall mortality and morbidity rates were 6.6% and 57.6% respectively.

While the POSSUM scoring system showed a significant difference between observed and expected mortality rates (*x2* test =24.04, 6 d.f., p <0.001), PPOSSUM scoring system showed good concordance between expected and observed mortality rates (*x2* test =9 6 d.f., p = 0.17).They concluded that PPOSSUM is a better predictor of post operative mortality rates and also suggested

widespread application among different regions to assess its validity and if a good fit was obtained; the equation could be adopted as a standard for risk

adjusted comparative audit as well as, enabling an individual surgeon or unit to assess the effectiveness of care provided.

Tekkis P15 analysed mortality in patients undergoing gastrointestinal surgery using POSSUM and P-POSSUM scoring systems. A total of 505 consecutive patients undergoing major gastrointestinal surgeries (elective 66.1%, emergency 33.9%) were analysed. The observed mortality rate was 56 deaths, while the expected mortality rate using POSSUM was 108 deaths, which was found to be a significant over prediction ($x2$ test = 44.82, 4 d.f., $p<0.001$). Using P-POSSUM, the expected rate was 57 ($x2$ test =3.34, 4 d.f., $p = 0.51$). Comparison suggests P-POSSUM as the recommended scoring system for risk adjusted performance measurement.

Zafirellis K D17 tested the applicability of POSSUM scoring system for assessing mortality rates in patients of oesophageal, undergoing oesophagectomy. A total of 204 patients were studied retrospectively and analysed using linear method of analysis. The observed and expected mortality rates were 12.7% and

19.1% respectively, showing a poor assessment of mortality rate prediction. They concluded that POSSUM scoring system required to be recalibrated to allow

better prediction of mortality rates in their study group.

Shuhaiber J H28 compared POSSUM and P-POSSUM in predicting

mortality rates following infra renal abdominal aortic aneurysm repair. 118 patients were included and outcomes compared using POSSUM, P-POSSUM and length of hospital stay hypothesis. The O: E ratio was 1.24 for POSSUM and 0.71 for P-POSSUM. They concluded by validating P-POSSUM and POSSUM for prediction of post operative mortality rate. Neary W D29 performed a Meta analysis of POSSUM and its modifications using Medline, Cochrane library and Embase databases. A description of the genesis of POSSUM was given, its method of application and

analysis. They described the exponential method of analysis which is the recommended method and also its limitations with respect to its complexity and its inability to predict the individual risk of adverse outcome. A description of the P-POSSUM system was given and its results in various studies were highlighted. The limitations of these studies were described; regarding missing data and the

timing of physiological scoring. The controversy regarding the recommended

investigations was also cleared. The lack of facilities for accurate measurement of the total blood loss was explained to be not significant to alter the final score.

The applicability of POSSUM in general surgery and its evolution for individual specialities was described and studies reviewed. A comparative analysis of

POSSUM and APACHE II was given and its superiority was stressed upon. The authors concluded by validating POSSUM as an important comparative surgical audit tool.

Tekkis P16 evaluated POSSUM and P-POSSUM in a prospective study in 1,017 patients undergoing colorectal surgery. The observed mortality rate was 7.5%, while the predicted rates by POSSUM and P-POSSUM were 8.2% and 7.1% respectively. They found an over prediction in the young patients ($p < 0.001$) and under prediction in emergency cases and elderly patients ($p < 0.05$). They have suggested recalibration in these groups of patients undergoing colorectal surgery.

Bennent-Guerrero E9 used P-POSSUM scoring system to compare

mortality rates among surgeries performed in the USA and UK. Prospective analysis of two cohorts in the USA (n = 1,056) and UK (n = 1,539) was done. PPOSSUM scoring system expected mortality rates showed significant fit to the observed mortality rates in the UK (156 and 152) and in the USA (82 and 22).

They were able to show a better outcome among patients undergoing surgeries in

the USA when compared to those in the UK (Odds ratio = 4.5, $p < 0.001$). They concluded by validating P-POSSUM as a predictor of post operative mortality rates and therefore, as a valid system of surgical audit to compare outcome among surgical systems in two different countries. Mohil R S20 compared POSSUM and P-POSSUM for predicting the adverse outcome rate in patients undergoing emergency laparotomy. 120 patients who underwent emergency laparotomy at Safdarjang hospital, Delhi, were studied

prospectively to assess the applicability in their setup. All patients had physiological scoring done at the time of admission and intra operative scoring was done to obtain the operative scoring variables, to calculate expected 30 day morbidity and mortality rates. Sixteen patients (13.3%) died within 30 days of surgery and 62 (51.7%) developed significant complications. On analysis, they found an O: E ratio of 0.62 for POSSUM ($x2$ test = 10.79, 9 d.f., $p = 0.148$) and 0.66 using P-POSSUM ($x2$ test = 5.33, 9 d.f., $p = 0.619$). They concluded by validating POSSUM and P-POSSUM scoring systems for accurate prediction of post operative mortality rates even in the Indian scenario, where the patients usually belonged to the low socioeconomic strata with very limited resources. POSSUM and P-POSSUM scoring systems can be used to help remove any bias in the patient selection and serve as important methods for predicting the post operative adverse outcome rate, even in their setup.

Parihar V21 performed a risk adjusted audit of low risk general surgical patients using the POSSUM and P-POSSUM scoring systems in 788 patients. They found good prediction of mortality using POSSUM (O: E ratio = 0.94) and P-POSSUM (O: E ratio = 1.525). In an effort to reduce the over prediction in low risk general surgical patients, they performed multi variate regression analysis to

obtain a new equation called Jabalpur POSSUM (J-POSSUM), which provided a better fit to the observed mortality and morbidity rates (O:E ratio = 1.04) in low risk general surgical patients. They validated POSSUM, P-POSSUM and JPOSSUM in predicting the adverse outcome rates in general surgical patients in the Indian setup.

Brooks M S32 compared POSSUM, P-POSSUM and surgical risk score among 949 patients undergoing general surgical procedures. They obtained a significant fit for predicting post operative mortality using P-POSSUM (observed and expected rates being 7.3 and 8.4 respectively) and surgical risk scoring system (5.9 and 8.4). They concluded by validating both the scoring systems for

predicting post operative mortality rates.

METHODOLOGY

Source of data:

This prospective study was carried out on patients undergoing major gastrointestinal surgical procedures admitted in department of general surgery of Rajiv Gandhi Government General Hospital, Chennai-03 from July to December 2012.

Study period:

The study period was from July 2012 to Dec 2012and the period of follow up was 30 days following the surgical procedure.

Method of collection of data:

Patients admitted under general surgery and scheduled to undergo major surgical procedures were scored according to their physiological and operative findings using a proforma sheet (Annexure I)

Inclusion criteria:

Patients undergoing any of the following major surgical procedures as defined by the POSSUM scoring system 5,

1. Any laparotomy
2. Bowel resection
3. Cholecystectomy

Exclusion criteria:

1. Age less than 12 years
2. Day care surgery
3. Follow up period criteria not met.

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Patients were informed regarding the aims and objectives of study and a detailed informed written consent was taken prior to inclusion into the study. The study protocol was approved by the local ethical clearance committee of this hospital. During hospitalisation relevant history was collected and appropriate investigations as deemed necessary were done using standard procedures. The patients were then scored depending on their physiological parameters and the intra operative findings were noted and a final expected mortality rate was calculated.

Physiological parameters:

	1	2	4	8
Age	<60	61-70	>71	
Cardiac signs Chest radiograph	No failure	Diuretic, digoxin, antianginal or antihypertensive therapy	Peripheral edema, warfarin therapy Borderline Cardiomegaly	Raised jugular venous pressure Cardiomegaly
Respiratory history Chest radiograph	No dyspnoea	Dyspnoea on exertion	Limiting dyspnoea Mild COAD	Dyspnoea at rest>30 Fibrosis or consolidation
Blood pressure	110-130	131-170 100-109	>171 90-99	<89
Pulse	50-80	81-100 40-49	101-120	>121 <39
Glasgow coma scale	15	12-14	9-11	<8
Hemoglobin	13-16	11.5-12.9 16.1-17	10-11.4 17.1-18	<9.9 >18.1
White cell count(x 1000)	4-10	10.1-20 3.1-4	>20.1 <3.1	
Urea(mmol/l)	<7.5	7.6-10	10.1-15	>15.1
Sodium(mmol/l)	>136	131-135	126-130	<125
Potassium(mmol/l)	3.5-5	3.2-3.4 5.2-5.3	2.9-3.1 5.4-5.9	<2.8 >6
ECG	Normal		Atrial fibrillation	Any other abnormal rhythm

Intra Operative Findings:

	1	2	4	8
Operative severity	Minor	Moderate	Major	Major+
Multiple procedures	1		2	>2
Total blood loss	<100	100-500	501-999	>1000
Peritoneal soiling	None	Minor	Local pus	Free bowel content, pus or blood
Presence of malignancy	None	Primary only	Nodal mets	Distant mets
Mode of surgery	Elective		Emergency resuscitation of >2h possible, Operation < 24 h after admission	Emergency (immediate surgery <2 h needed)

Physiological score (12-88), Operative score (9-44)

For mortality it is,

Loge [R/1-R] = (0.1692 x PS) + (0.155 x OS) - 9.065.

Where R = risk of mortality.

The patients were then followed up for a period of 30 days following the surgical procedure and complications if any, were noted depending upon the following criteria as defined for POSSUM scoring system..

- **Minor bleeding**: local haematoma requiring evacuation.
- **Significant bleeding**: postoperative bleeding requiring re- exploration.
- **Chest infection**: Cough with expectoration +/- pyrexia with radiological evidence.
- **Wound infection**: Wound gaping with serous or purulent exudates.
- **UTI:** Fever with positive microbial evidence.
- **Deep infection**: the presence of an peritoneal collection confirmed clinically or radiologically.
- **Septicaemia**: positive blood culture.
- **Pyrexia of unknown origin**: Sustained fever more than 3 days with negative for routine fever workup
- **Wound dehiscence**: superficial or deep wound breakdown.
- **Deep venous thrombosis :** when suspected, confirmed
- radiologically by venography.
- **Cardiac failure**: symptoms or signs of left ventricular or congestive cardiac failure
- **Impaired renal function**: arbitrarily defined as increase in blood urea > 5mmol/l from preoperative levels.

- **Hypotension**: a fall in systolic blood pressure below 90 mmHg for more than 2hours as determined by sphygmomanometry or arterial pressure transducer measurement.
- **Respiratory failure**: respiratory difficulty requiring emergency ventilation.
- **Anastomotic leak**: discharge of bowel content via the drain, wound or abnormal orifice.

Statistical methods:

The expected mortality rate was obtained using linear regression analysis and the O: E ratio was calculated. Chi square test was then applied to obtain the p value to note any significant difference between the predicted death rate and the actual outcome. Rate of increment in deaths for each risk factor was calculated based on the hypothesis that deaths were linearly related with the score for each of the studied risk factors and 't' test was applied to validate this hypothesis.

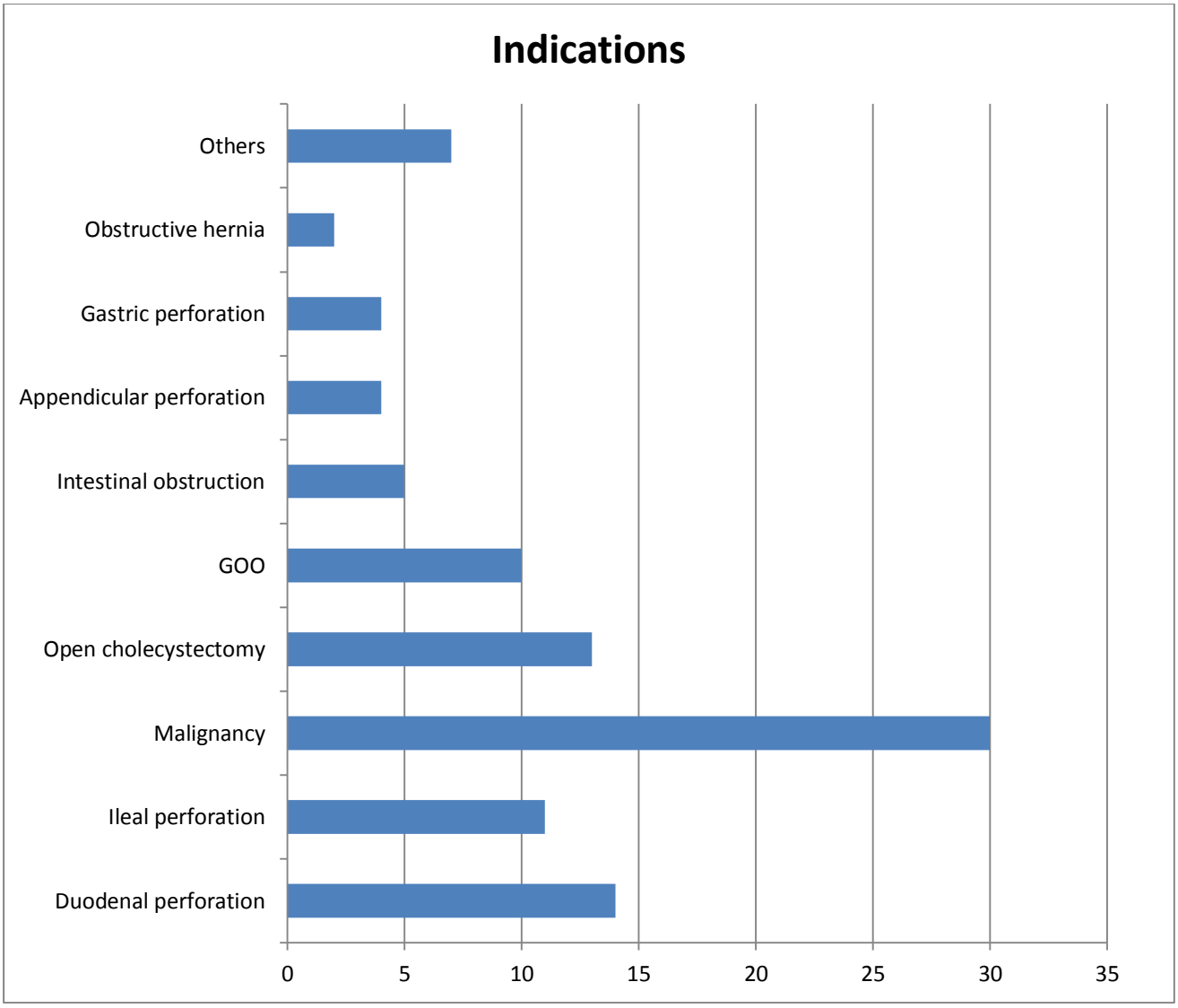
RESULTS

A total of one hundred gastro intestinal surgical operations were performed between July 2012 and December 2012.

Two patients underwent two major surgical operations. There were 44emergency and 56 elective procedures.

Indications

S.no.	Indications	No. Of patients
1.	Duodenal perforation	14
2.	Intestinal obstruction	05
3.	Ileal perforation	11
4.	Gastric perforation	04
5.	Appendicular perforation	04
6.	Obstructed hernia	02
7.	Malignancy	34
8.	Open cholecystectomy with/without CBD exploration	13
9.	Gastric outlet obstruction	6
10.	Others	7
	Total	100



Mode of surgery:

There were 44 emergency and 56 elective surgeries performed.

Types of major surgeries performed:

There were four types of major surgeries performed in our group

Outcome of surgery

Of the 100 procedures studied, 14 of them were associated with death of the patient resulting in crude mortality rate of 14% represented in graph

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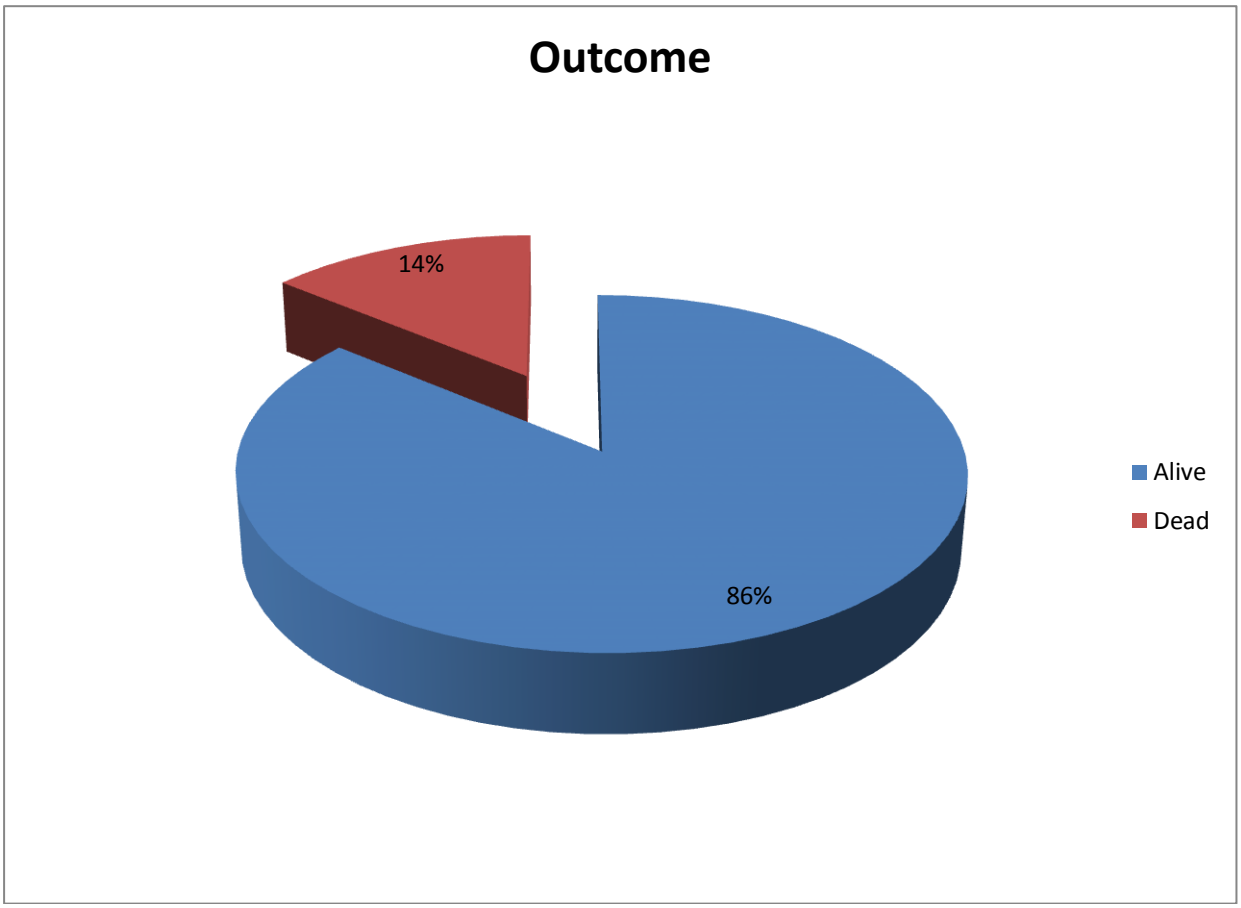
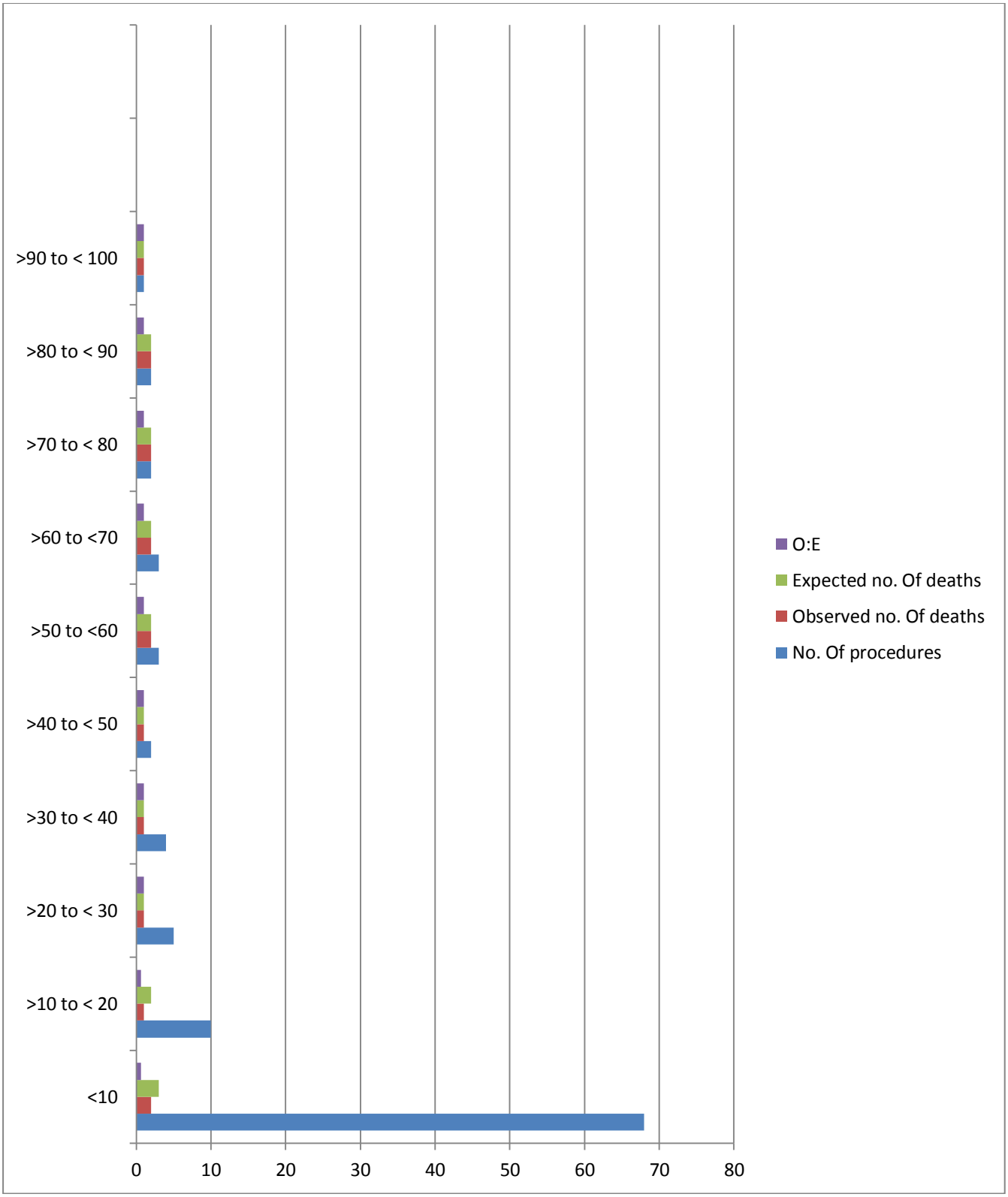


Observed: Expected mortality rate:

Comparison of observed and P-POSSUM predicted mortality rates was done using linear analysis . An observed to expected ratio (O: E) of 0.93 was obtained and there was no significant difference between the predicted and observed values ($x2 = 0.999559$, 9 d., P = 0.9994).

Comparison of observed and expected mortality rate

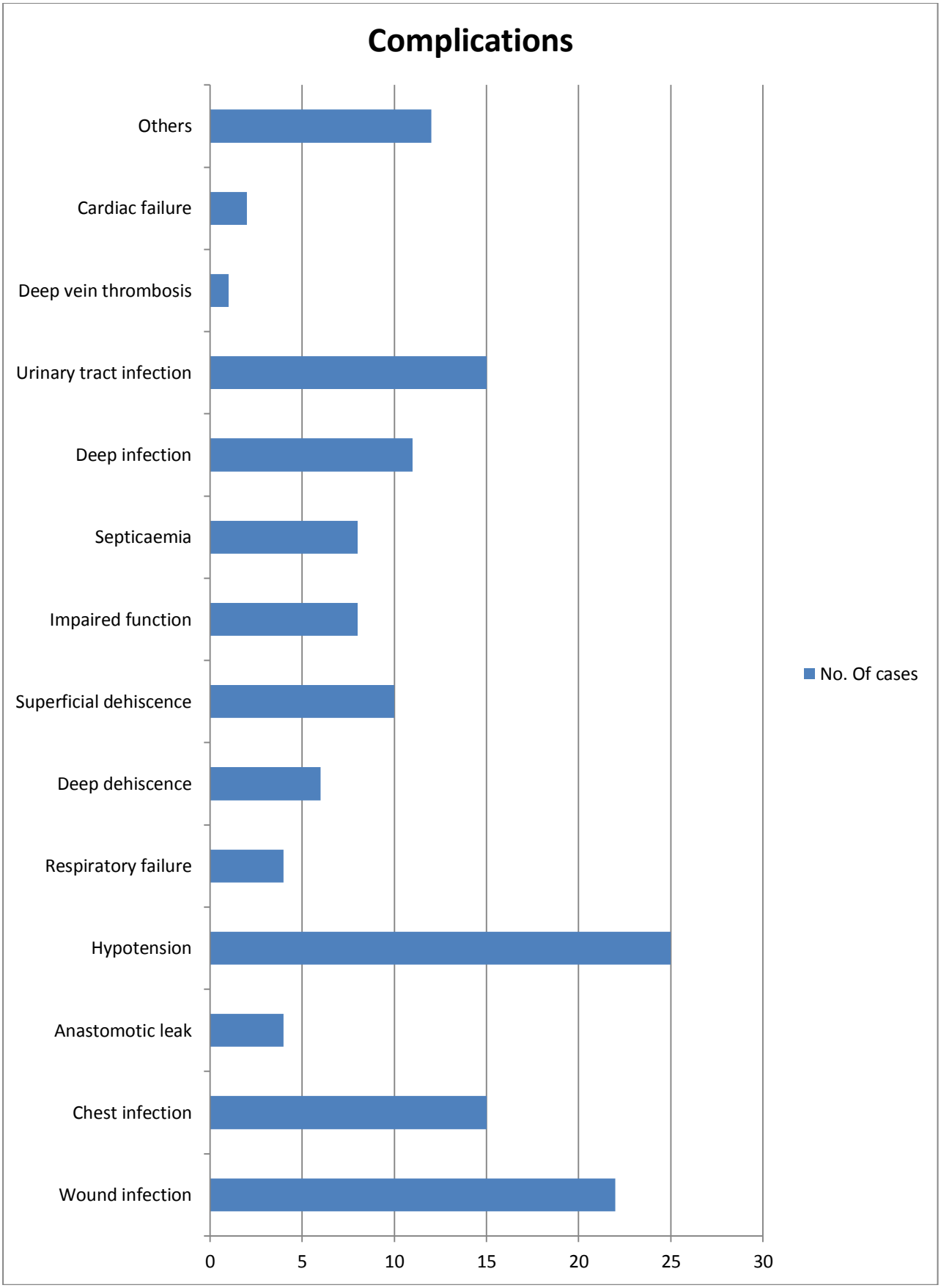
Predicted mortality rate	No. Of procedures	Observed no. Of deaths	Expected no. Of deaths	O:E
<10	68	2	3	0.67
>10 to < 20	10	1	2	0.67
>20 to < 30	5	1	1	1.00
>30 to < 40	4	1	1	1.00
>40 to < 50	2	1	1	1.00
>50 to <60	3	2	2	1.00
>60 to <70	3	2	2	1.00
>70 to < 80	2	2	2	1.00
>80 to < 90	2	2	2	1.00
>90 to < 100	1	1	1	1.00
Total	100	14	15	0.93


>90 to < 100
>80 to < 90
>70 to < 80
>60 to <70
>50 to <60
>40 to < 50
>30 to < 40
>20 to < 30
>10 to < 20
<10
0
10
20
30
40
50
60
70
80
O:E
Expected no. Of deaths
Observed no. Of deaths
No. Of procedures

Complications:

The complications occurring during the 30 day follow up period following the
surgeries are listed in table.

	Type	No. Of cases
1.	Wound infection	22
2.	Chest infection	15
3.	Anastomotic leak	04
4.	Hypotension	25
5.	Respiratory failure	04
6.	Deep dehiscence	06
7.	Superficial dehiscence	10
8.	Impaired function	08
9.	Septicaemia	08
10.	Deep infection	11
11.	Urinary tract infection	15
12.	Deep vein thrombosis	01
13.	Cardiac failure	02
14.	Others	12
	Total	143


Complications
Others
Cardiac failure
Deep vein thrombosis
Urinary tract infection
Deep infection
Septicaemia
Impaired function
Superficial dehiscence
Deep dehiscence
Respiratory failure
Hypotension
Anastomotic leak
Chest infection
Wound infection
0
5
10
15
20
25
30
No. Of cases

RISK FACTORS

The analysis of risk factors for low outcome in our study is represented BELOW.

	Risk factors	Correlation	Rate of increment per score	T	P
1.	Mode of surgery	0.107	0.0493	1.064	0.290
2.	Malignancy	0.124	0.0121	1.237	0.219
3.	ECG	0.538	0.1243	6.318	0.000*
4.	Peritoneal contamination	0.262	0.0290	2.692	0.008*
5.	Total blood loss	.212	0.1502	2.151	0.034*
6.	Potassium	0.552	0.0471	6.561	0.000*
7.	Sodium	0.577	0.1263	7.002	0.000*
8.	Blood urea	0.516	0.0656	5.958	0.000*
9.	White cell count	0.573	0.0403	6.925	0.000*
10.	hemoglobin	0.247	0.0119	2.521	0.013*
11.	GCS				
12.	pulserate	0.337	0.0555	3.547	0.001*
13.	Blood pressure	0.500	0.0424	5.710	0.000*
14.	Respiratory system	0.506	0.0713	5.803	0.000*
15.	Cardiovascular system	0.477	0.1143	5.638	0.000*
16.	Age	0.316	0.1091	3.297	0.001*
17.	Multiple surgeries	0.354	0.1428	80.909	0.000*

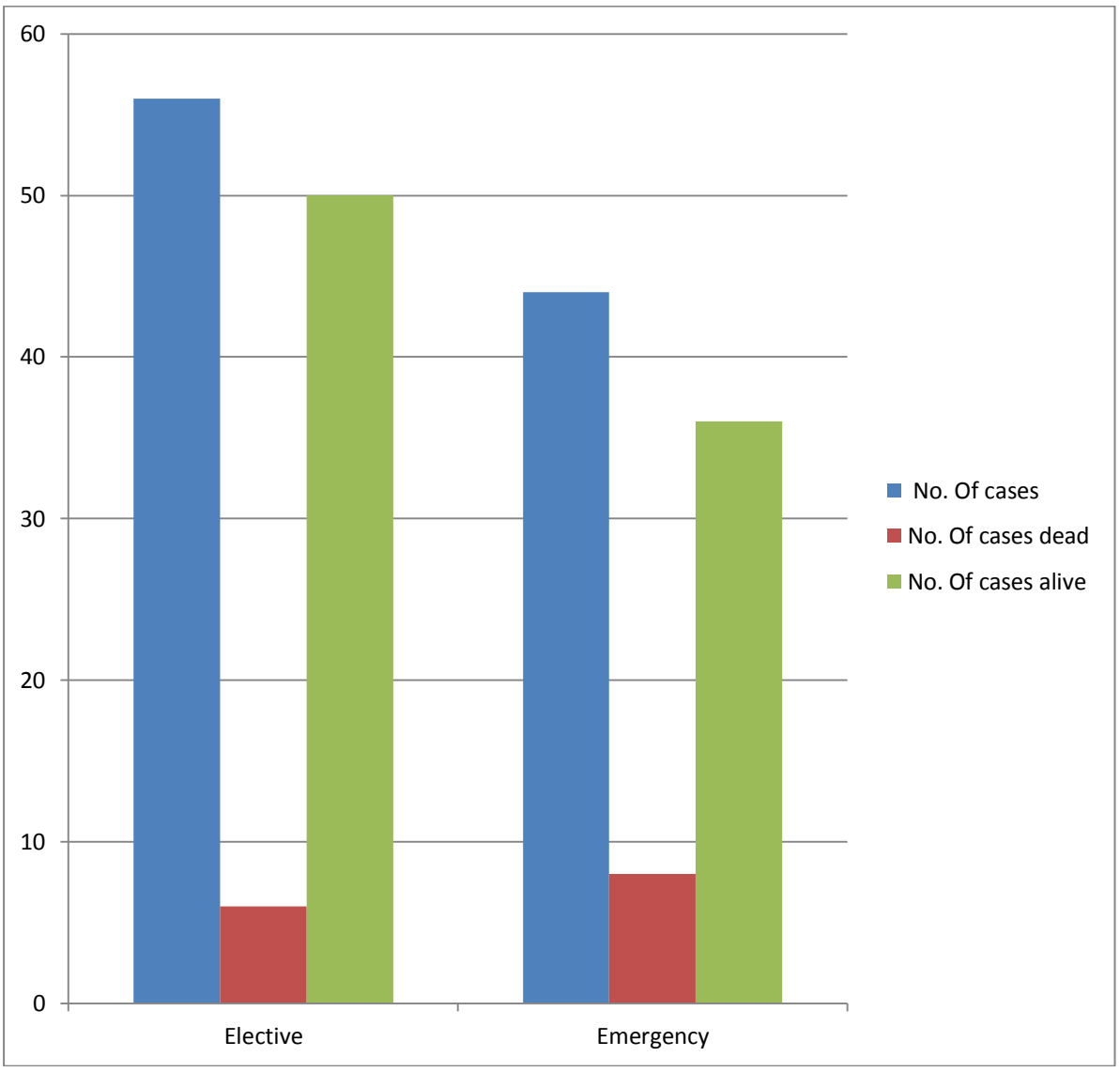
($p < 0.05$ = significant)

1. Mode of surgery

There were 5 deaths (9%) among 56 elective cases and 9 deaths (20%) from 44 emergency major surgeries in our study. A positive rate of increment of deaths per score was obtained.

Mode	No. Of cases	No. Of cases dead	No. Of cases alive
Elective	56	6	50
Emergency	44	8	36

Mode of Surgery

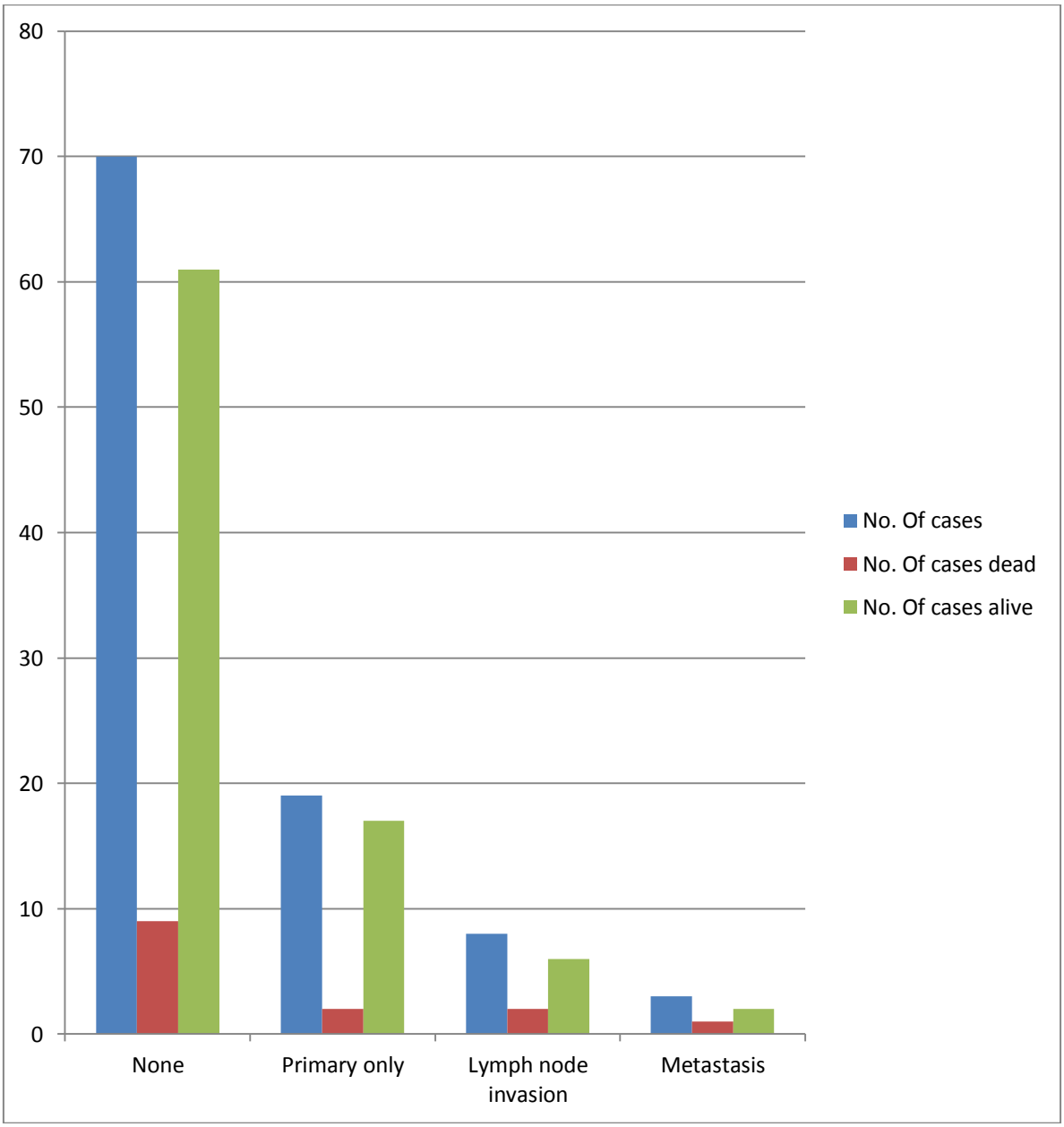


2. Malignancy

There were 30 cases with malignancies on which surgery was done. There were 19 cases with primary only, with 1 death, 8 cases with lymph node involvement with 2 death and 3 cases with disseminated metastasis accounting for 1 death. A positive rate of increment of deaths per score was obtained suggesting association of malignancy with adverse outcome and statistically significant association was obtained.

Malignancy	No. Of cases	No. Of cases dead	No. Of cases alive
None	70	9	61
Primary only	19	2	17
Lymph node invasion	8	2	6
Metastasis	3	1	2

Malignancy

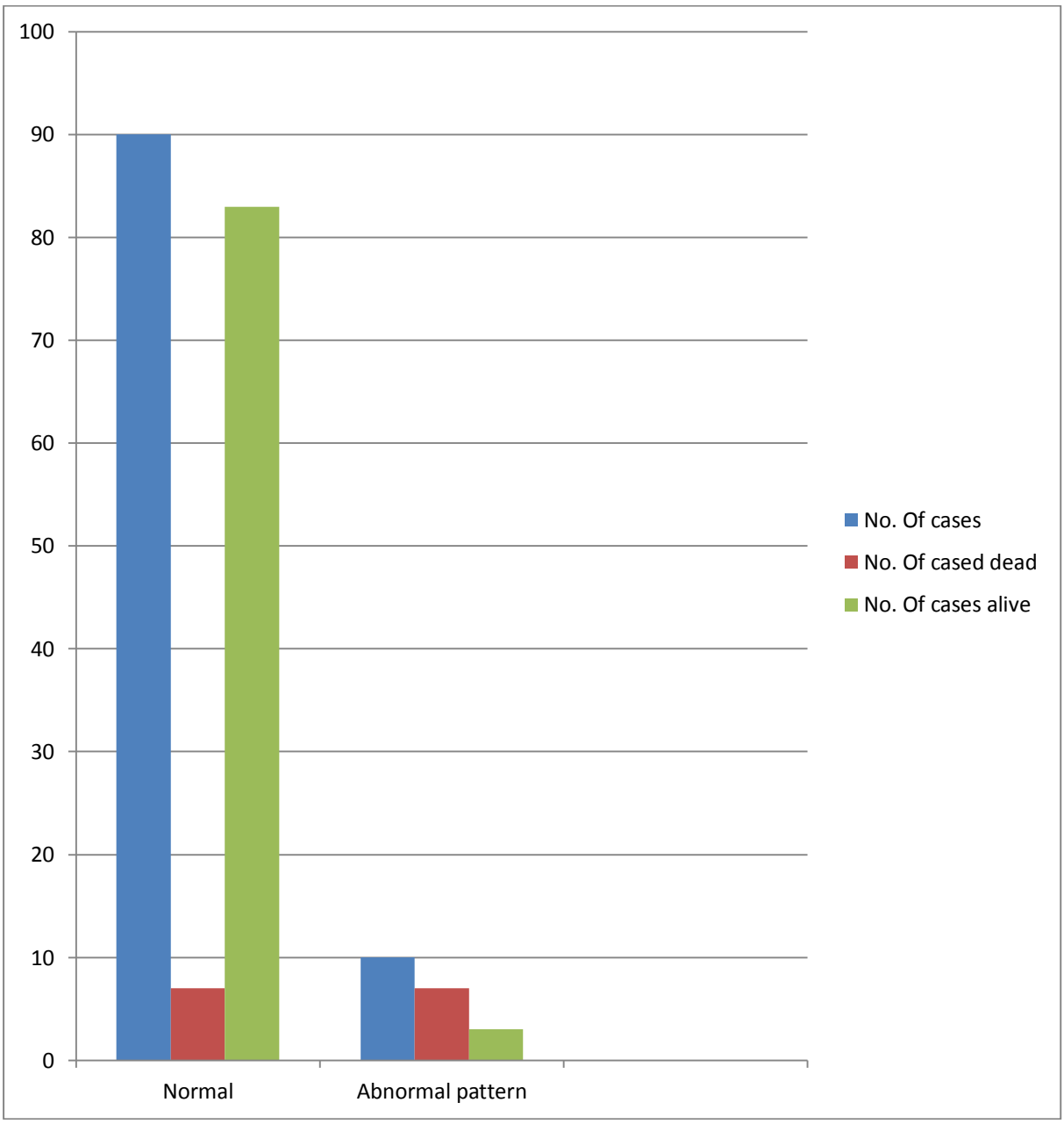

80
70
60
50
40
30
20
10
0
None
Primary only
Lymph node invasion
Metastasis
No. Of cases
No. Of cases dead
No. Of cases alive

3. Electrocardiogram findings

There were 10 cases with electrocardiographic abnormalities (scored 8 points) who were subjected to major general surgery and 7 patients died. A positive rate of increment of deaths with score was obtained.

Electrocardiogram	No. Of cases	No. Of cased dead	No. Of cases alive
Normal	90	7	83
Abnormal pattern	10	7	3

ECG findings

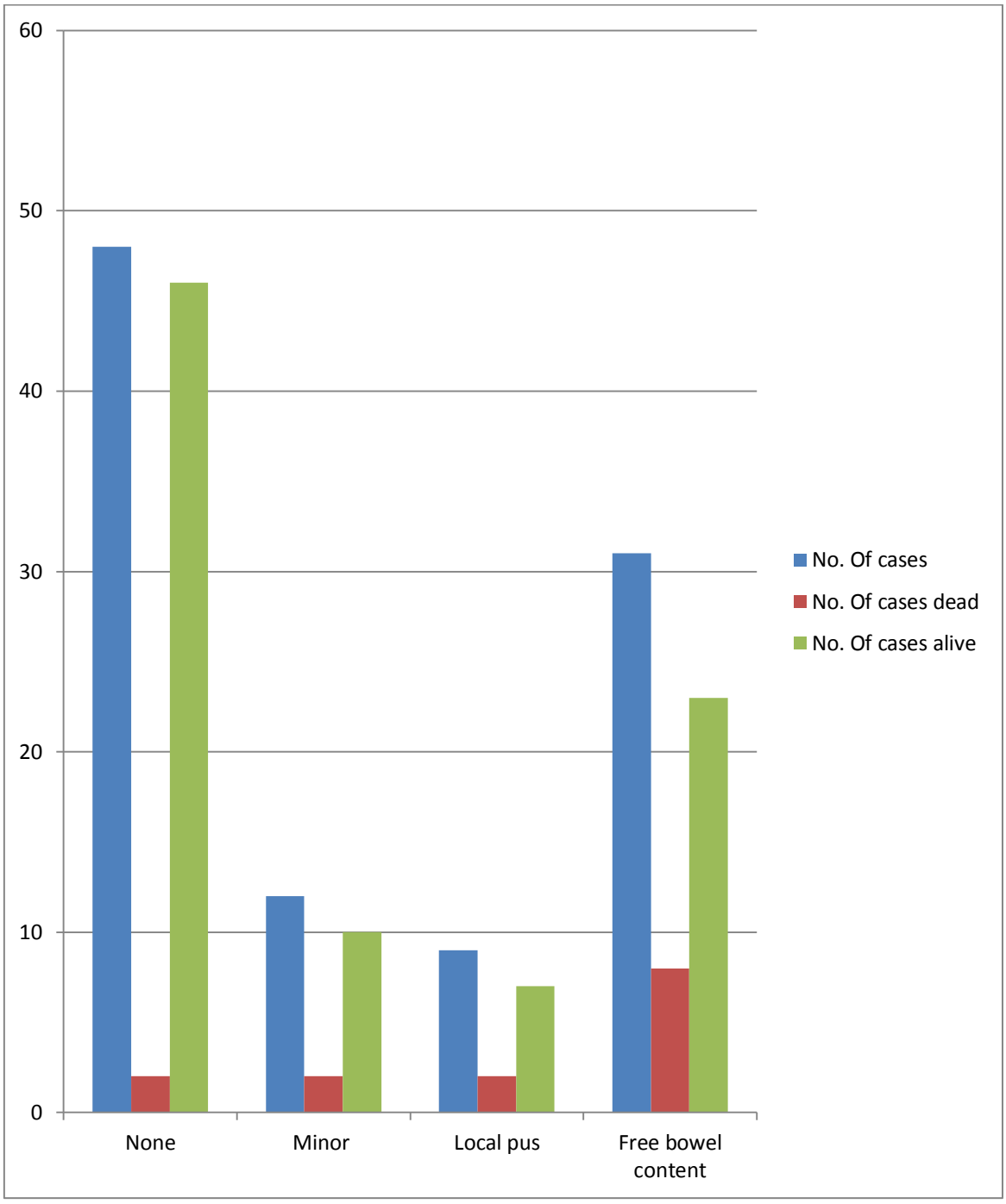


4. Peritoneal contamination

In a total of 100 surgeries, some degree of peritoneal contamination was found and 52 surgeries (52%) were associated with free bowel content, blood or gross pus. A positive rate of increment of deaths per score was obtained suggesting association of degree of peritoneal contamination with adverse outcome but was not found to be statistically significant.

Peritoneal contamination	No. Of cases	No. Of cases dead	No. Of cases alive
None	48	2	46
Minor	12	2	10
Local pus	9	2	7
Free bowel content	31	8	23

Peritoneal contamination

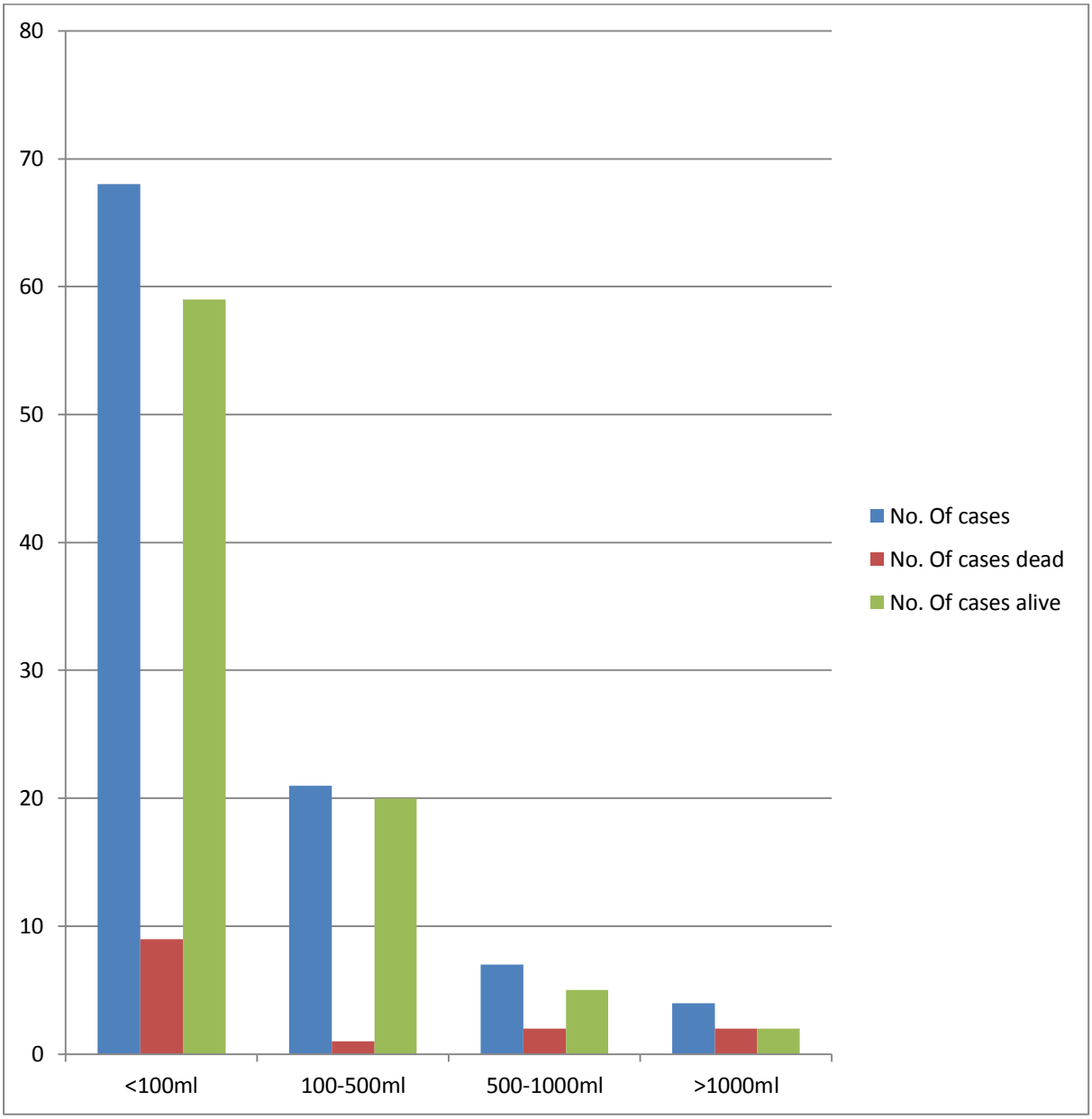


5. Total blood loss

In our study we found majority of cases resulted in 100-500 ml blood loss (21 cases, 21%),of which 1 cases died, which also accounted for majority of mortalities .There were 7 cases with 500-1000ml blood loss of which 2 case died during the study period. There were 4 cases with > 1000ml blood loss in our study of which 2 died. On analysis, a positive rate of increment with deaths in relation to increase in scores was found, suggesting correlation of higher blood loss with more adverse outcome and was found to be statistically significant.

Total blood loss	No. Of cases	No. Of cases dead	No. Of cases alive
<100ml	68	9	59
100-500ml	21	1	20
500-1000ml	7	2	5
>1000ml	4	2	2

Total Blood loss

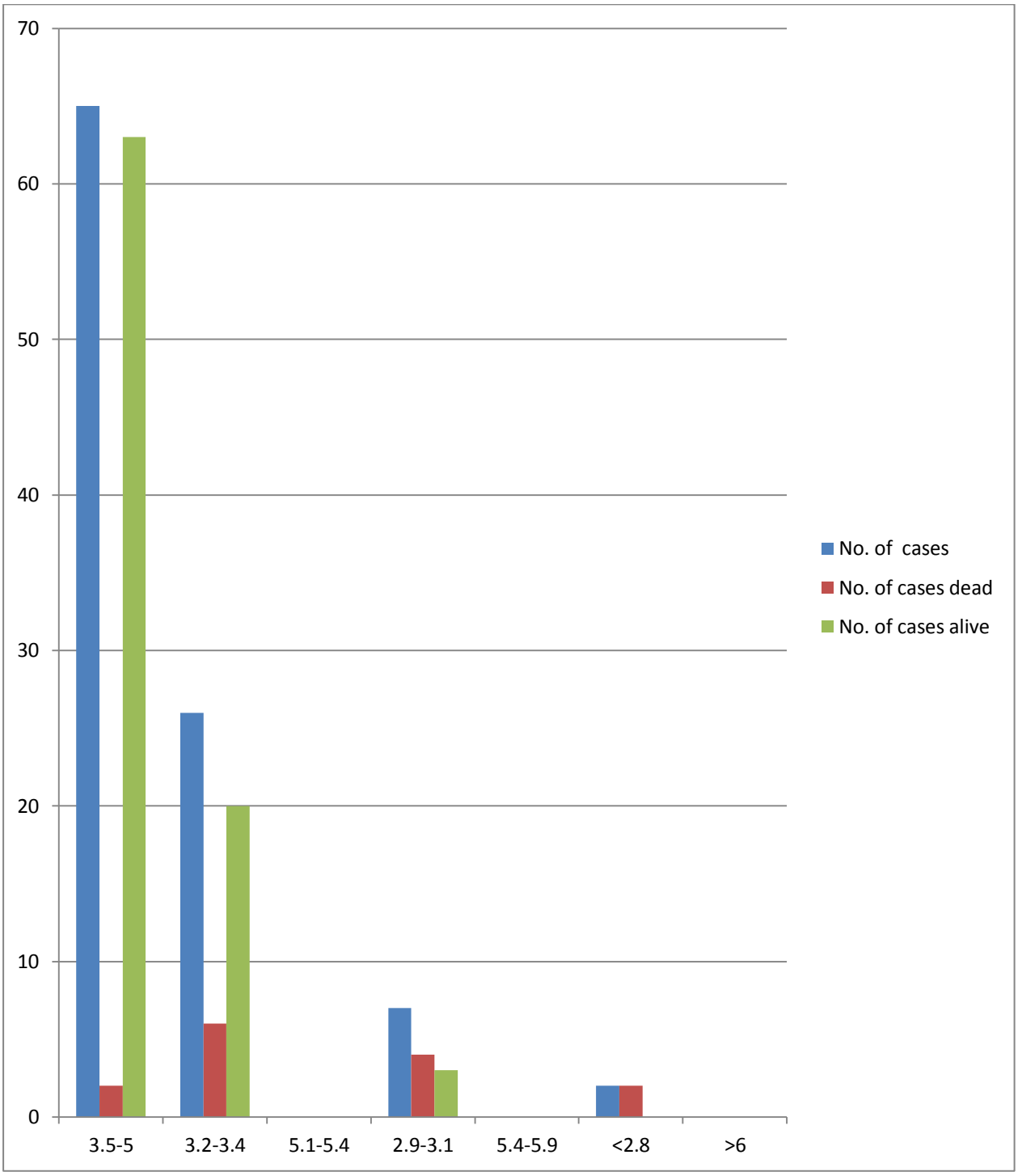


6. Serum potassium

Our study group comprised of 35 surgeries (35%) performed on patients with some degree of imbalance in serum potassium concentration which accounted for 12 deaths . On analysis a positive rate of increment per score was obtained suggesting correlation of deaths with scoring of imbalance in potassium concentration but was not statistically significant.

K+(mmol/l)	No. of cases	No. of cases dead	No. of cases alive
3.5-5	65	2	63
3.2-3.4 5.1-5.4	26	6	20
2.9-3.1 5.4-5.9	7	4	3
<2.8 >6	2	2	0

Serum potassium

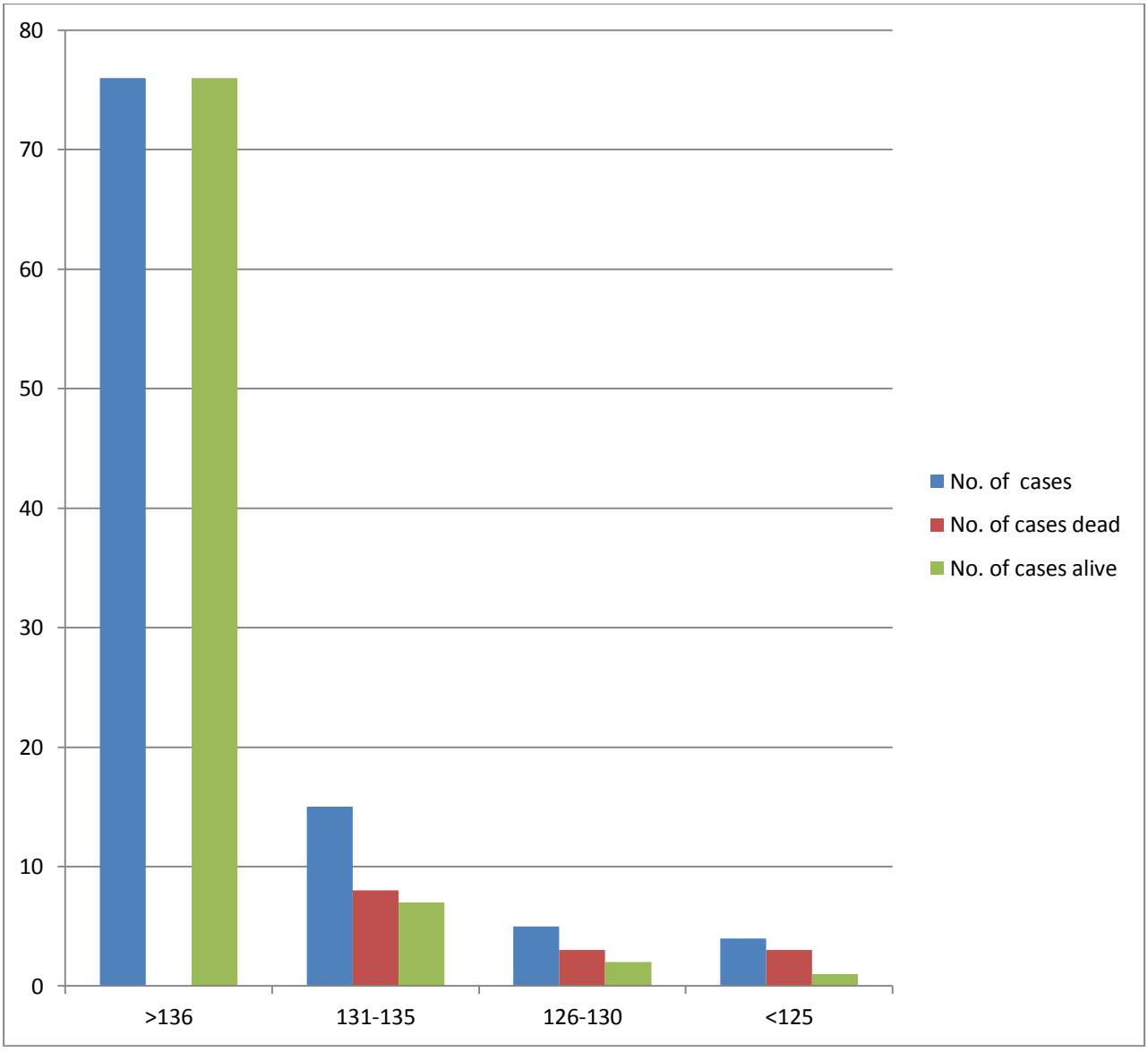


7. Serum sodium

Surgeries done on cases with serum sodium abnormalities accounted for 24 cases (24%), with mortality occurring in 14 cases (100%). A positive rate of increment of deaths was found on analysis and was found to be statistically significant.

Na+	No. of cases	No. of cases dead	No. of cases alive
>136	76	0	76
131-135	15	8	7
126-130	5	3	2
<125	4	3	1

Serum sodium

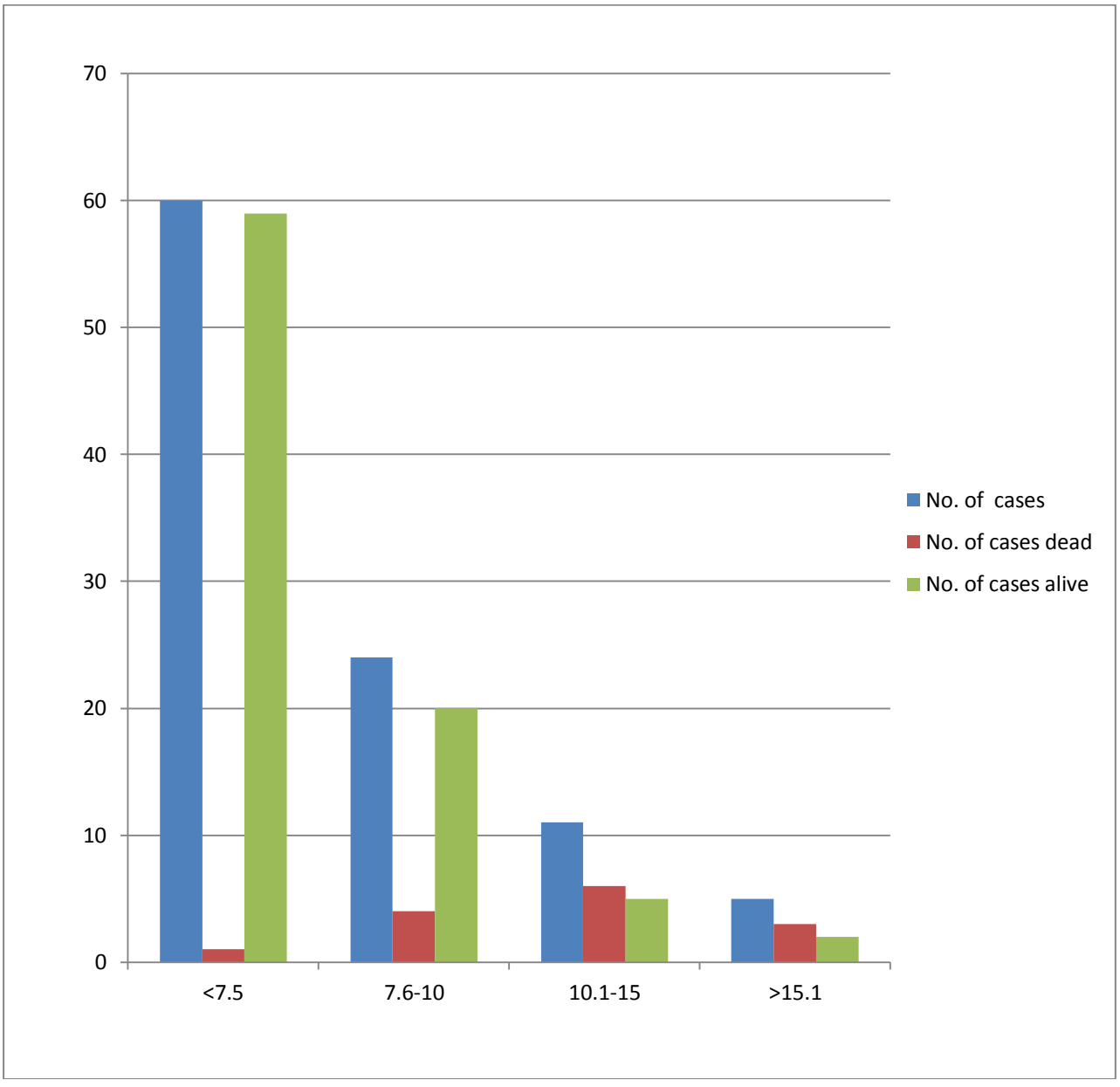


8. Blood urea

A total of 40 procedures (40%) were performed on patients with elevated blood urea levels and these cases accounted for13 of 14 deaths. A positive rate of increment of death with score was obtained and was found to be statistically significant.

Blood urea(mmol/l)	No. of cases	No. of cases dead	No. of cases alive
<7.5	60	1	59
7.6-10	24	4	20
10.1-15	11	6	5
>15.1	5	3	2

Blood Urea

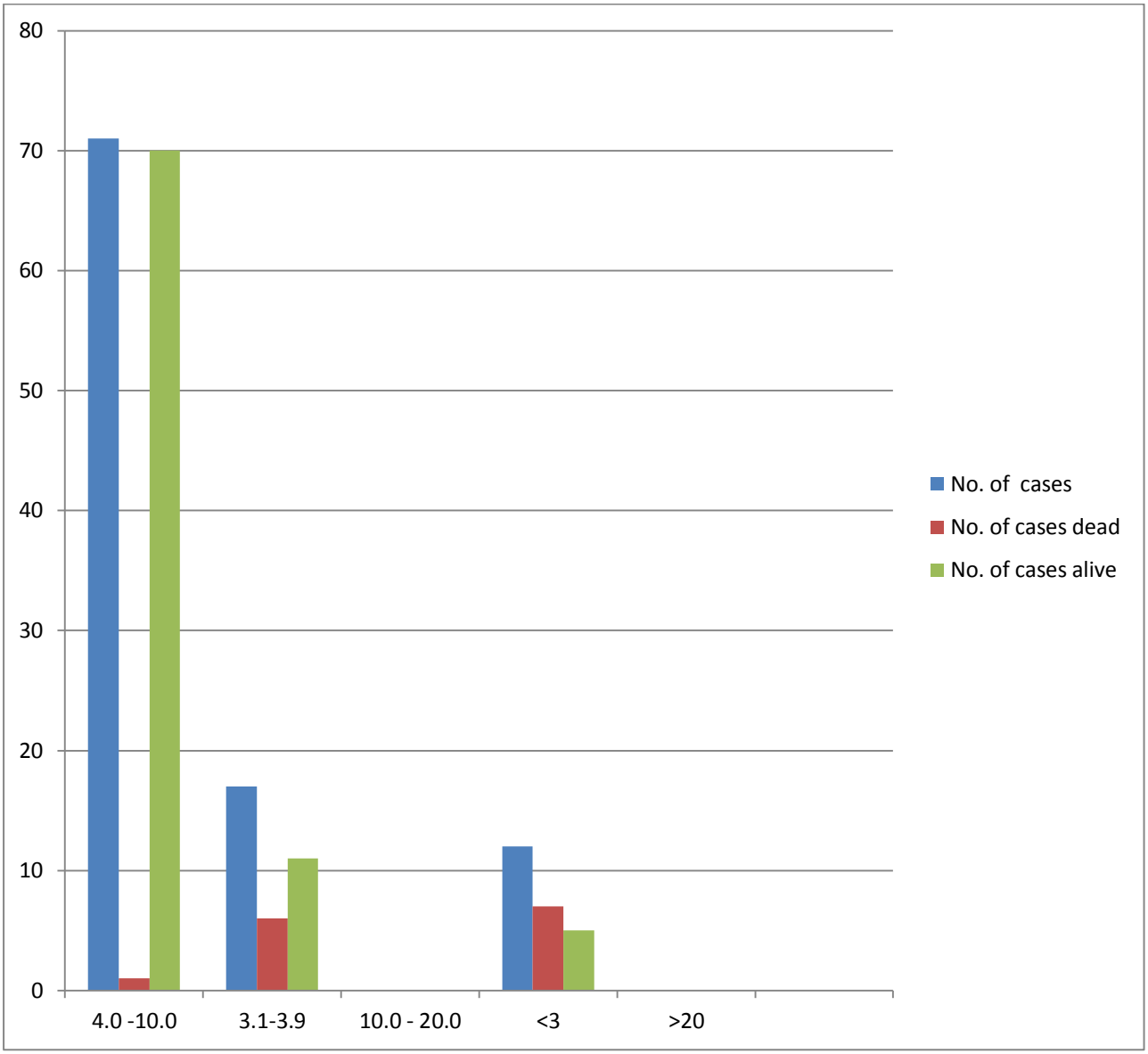

70
60
50
40
30
20
10
0
<7.5
7.6-10
10.1-15
>15.1
No. of cases
No. of cases dead
No. of cases alive

9. White cell count

Surgeries done on patients with leucocytosis accounted for 29 cases (29%)with 13 deaths occurring in this group. A positive rate of increment of deaths with higher score was obtained and was found to be statistically significant.

White cell count x 1000/cu mm	No. of cases	No. of cases dead	No. of cases alive
4 - 10	71	1	70
3.1-3.9 10 - 20	17	6	11
<3 >20	12	7	5

White cell count

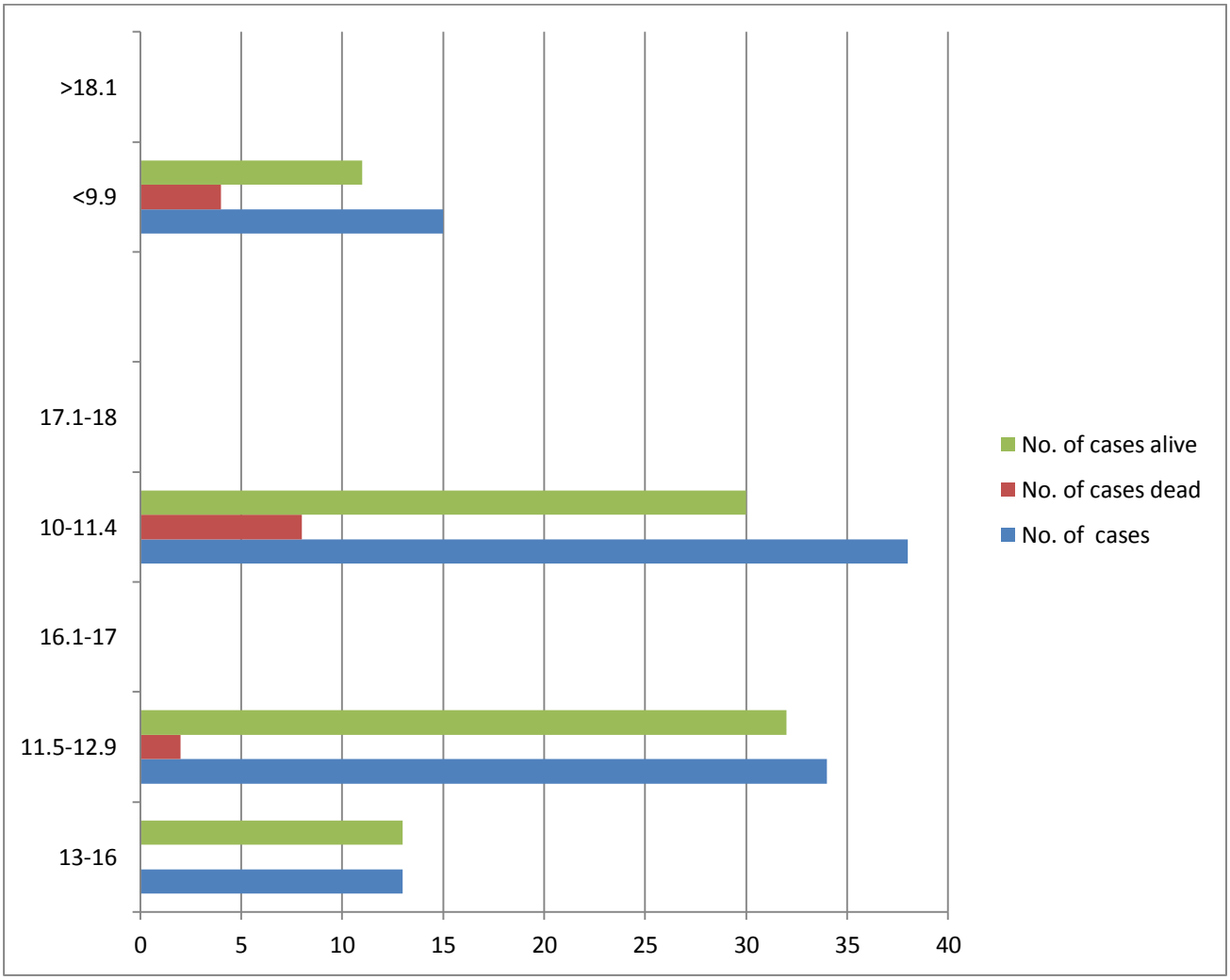


10. Haemoglobin

A majority of the procedures were done on patients with abnormalities in haemoglobin levels (87 cases) and these cases accounted for 14 deaths. A positive rate of increment of deaths with adverse score was obtained but was not found to be statistically significant.

Haemoglobin(g/dl)	No. of cases	No. of cases dead	No. of cases alive
13-16	13	0	13
11.5-12.9 16.1-17	34	2	32
10-11.4 17.1-18	38	8	30
<9.9 >18.1	15	4	11

Haemoglobin



11. Glasgow coma scale

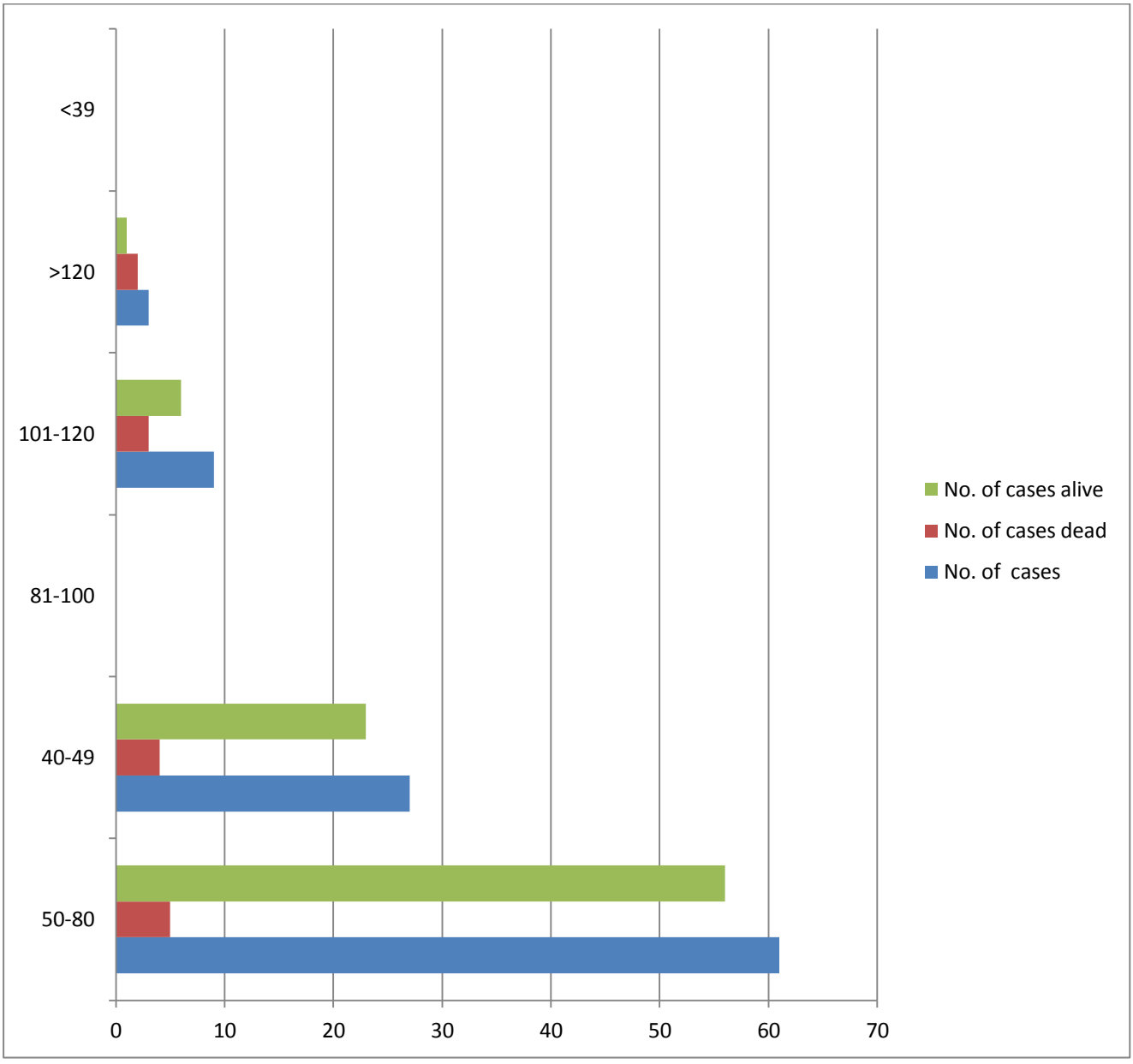
There were no patients with score less than 15 in our study. A positive rate of increment of deaths with higher POSSUM score was obtained but was not found to be statistically significant.

12. Pulse rate

A total of 39 surgeries were done on patients with higher POSSUM scores for pulse rate and accounted for 9 deaths. A positive rate of increment of deaths with higher POSSUM scores was found in our study but was not found to be statistically significant.

Pulse rate	No. of cases	No. of cases dead	No. of cases alive
50-80	61	5	56
40-49 81-100	27	4	23
101-120	9	3	6
>120 <39	3	2	1

Pulse Rate

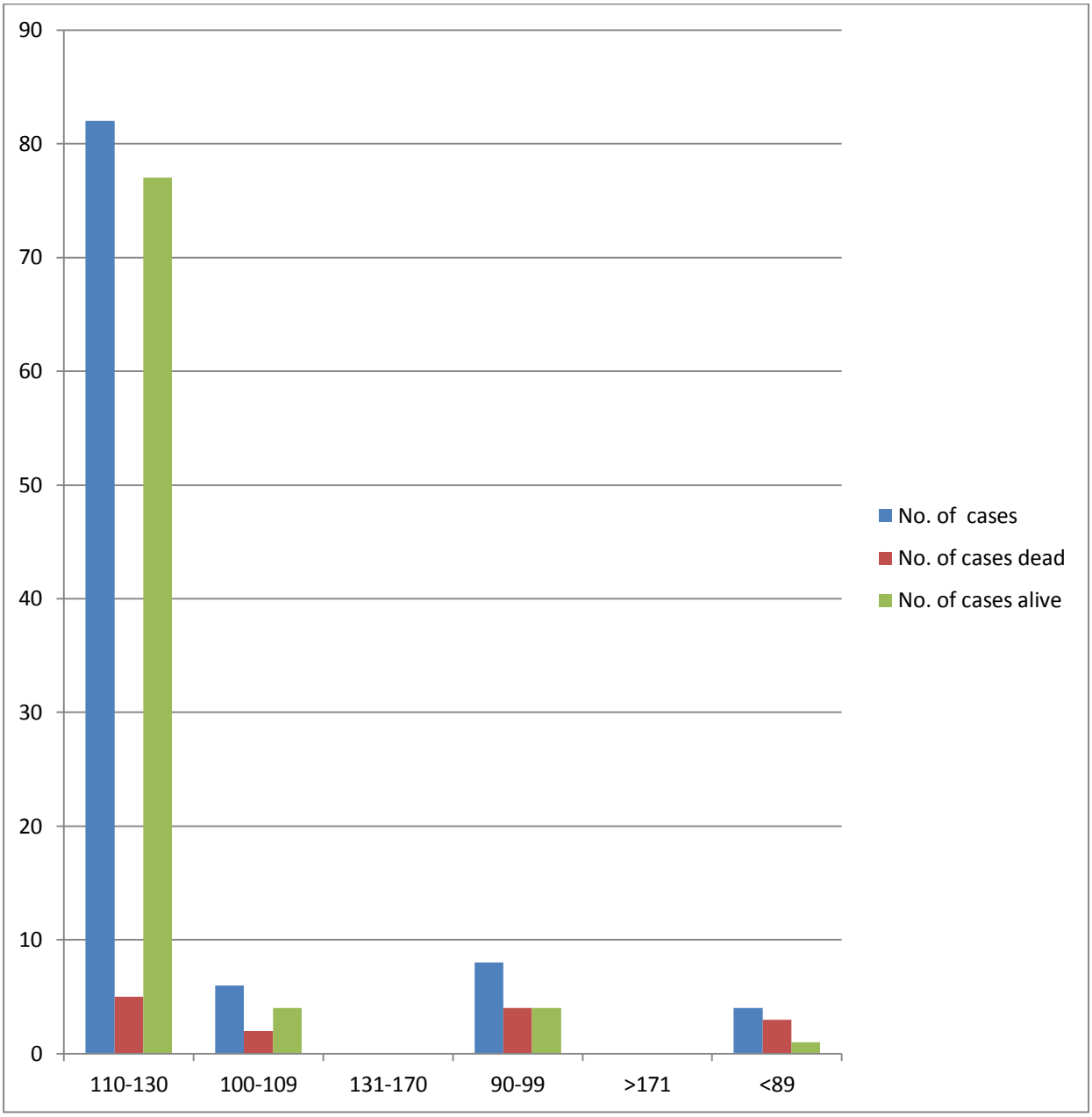

<39
>120
101-120
81-100
40-49
50-80
0
10
20
30
40
50
60
70
No. of cases alive
No. of cases dead
No. of cases

13. Blood pressure

A total of 18 procedures were done on patients with higher POSSUM score for blood pressure and these cases accounted for 9 deaths .A positive rate of increment of deaths with higher POSSUM scores was found in our study group but was not found to be statistically significant.

Blood pressure	No. of cases	No. of cases dead	No. of cases alive
110-130	82	5	77
100-109 131-170	6	2	4
90-99 >171	8	4	4
<89	4	3	1

Blood pressure

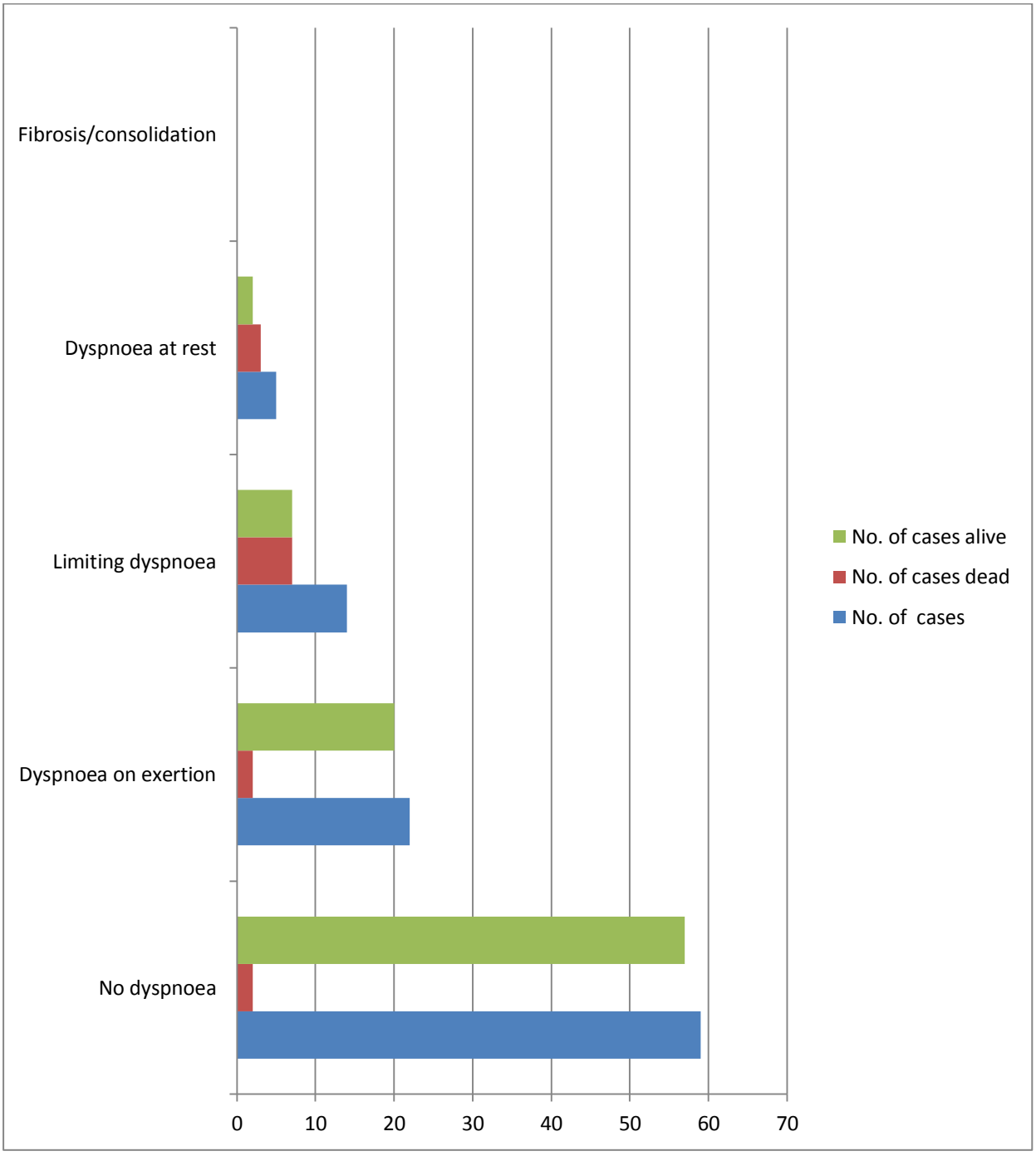


14. Respiratory system

A total of 41 surgeries were performed on patients with higher POSSUM scores and these procedures resulted in 12 deaths .A positive rate of increment of deaths with higher POSSUM scores for respiratory system was found but was not found to be statistically significant.

Respiratory system	No. of cases	No. of cases dead	No. of cases alive
No dyspnoea	59	2	57
Dyspnoea on exertion	22	2	20
Limiting dyspnoea	14	7	7
Dyspnoea at rest Fibrosis/consolidation	5	3	2

Respiratory system

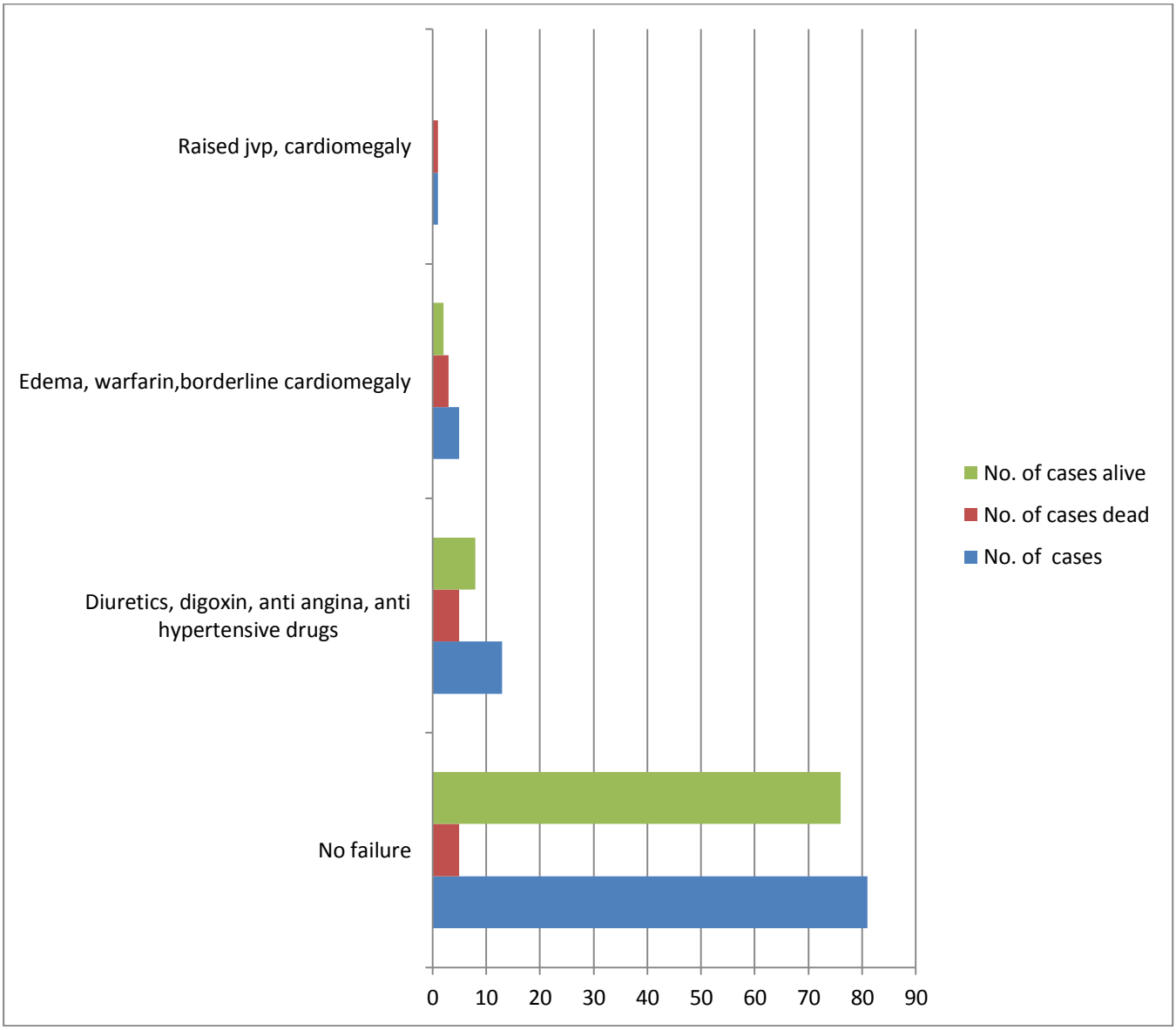


15. Cardiovascular system

There were only 19 surgeries performed on patients with higher POSSUM scores and resulted in 9 deaths . A positive rate of increment of deaths per score was found in our study but was not found to be statistically significant.

CVS	No. of cases	No. of cases dead	No. of cases alive
No failure	81	5	76
Diuretics, digoxin, anti angina, anti hypertensive drugs	13	5	8
Edema, warfarin,borderline cardiomegaly	5	3	2
Raised jvp, cardiomegaly	1	1	0

Cardiovascular system

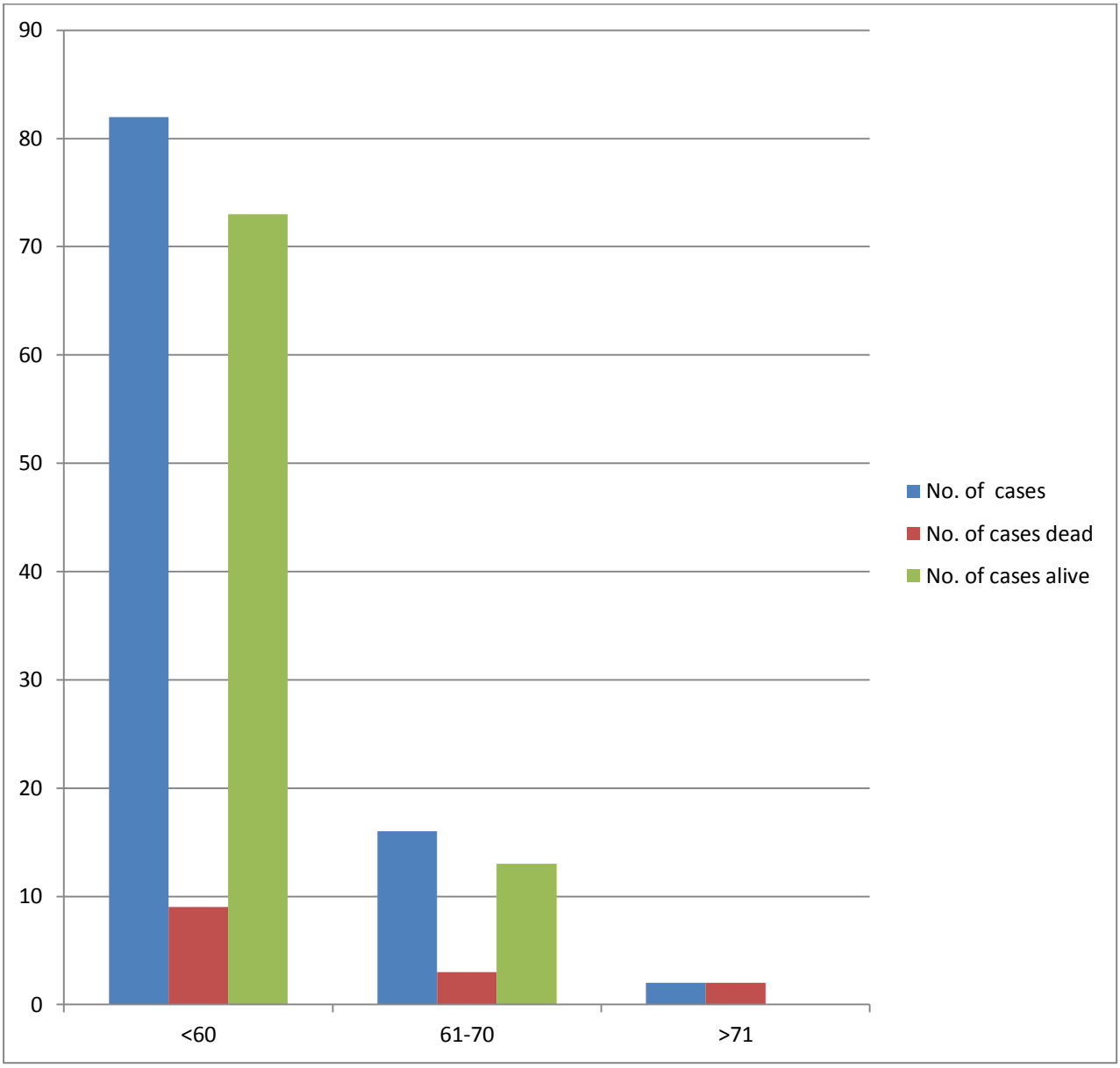


16. Age

A total of 18 surgeries were performed on patients with age more than 60 years and these cases accounted for 5 deaths . A poitive rate of increment was found between deaths and higher POSSUM scores for age of the patient.

Age	No. of cases	No. of cases dead	No. of cases alive
<60	82	9	73
61-70	16	3	13
>71	2	2	0

Age

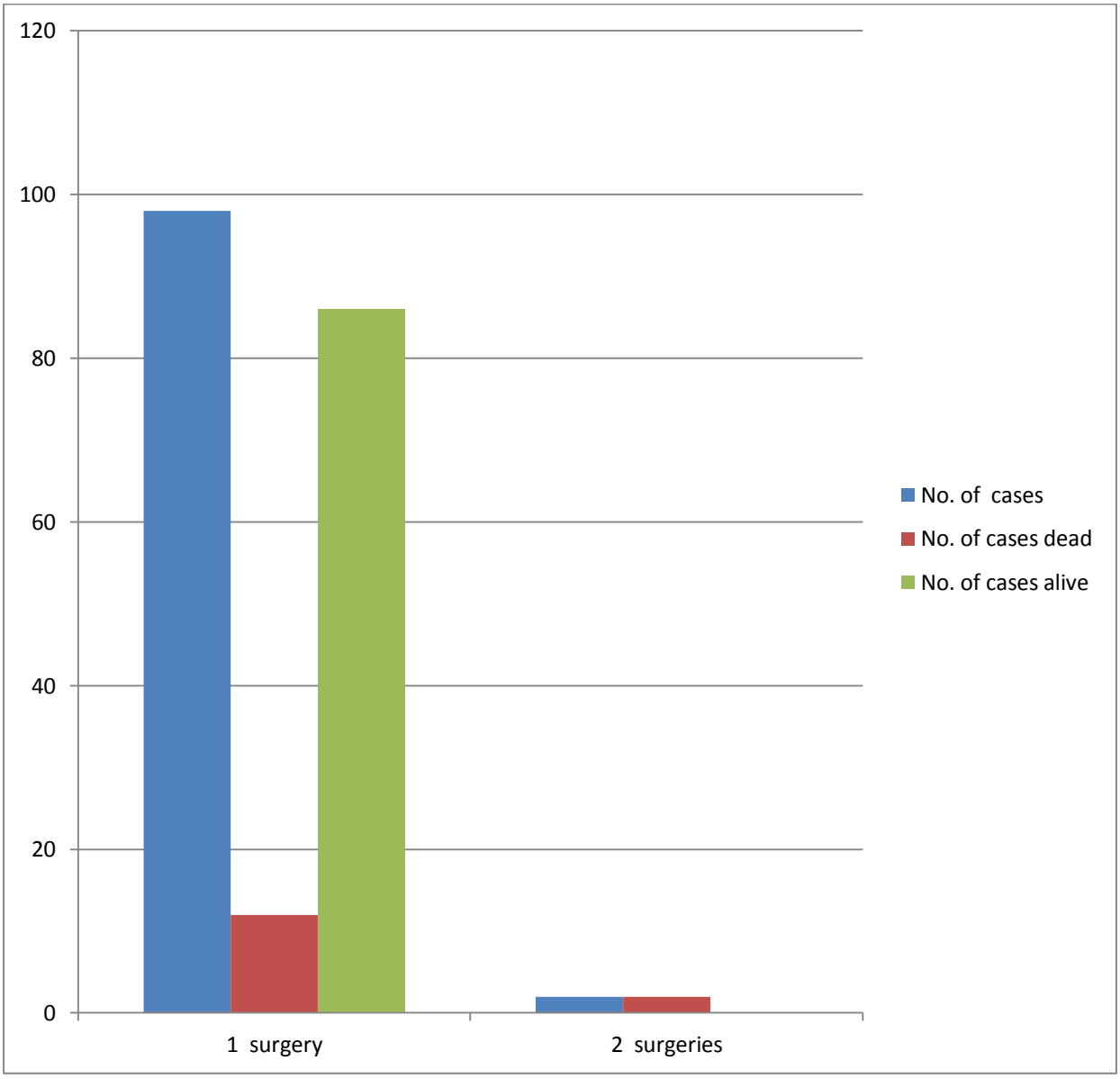

90
80
70
60
50
40
30
20
10
0
<60
61-70
>71
No. of cases
No. of cases dead
No. of cases alive

17. Multiple surgeries

There were 2 multiple surgeries performed in our study which accounted for 2 deaths. A positive increment of deaths with higher POSSUM score was found.

Multiple surgeries	No. of cases	No. of cases dead	No. of cases alive
1 surgery	98	12	86
2 surgeries	2	2	0

Multiple surgeries



DISCUSSION

The basic tenet in medical care has been to provide quality care to the patient to cause reduction in adverse outcome. It is by comparing the adverse outcome rates that we can assess the adequacy of care provided to the patient and evolve new treatment strategies. However, comparison using crude mortality rates can be misleading as it cannot adequately account for the patient's general condition and the disease process for which he was subjected to surgery. To overcome this shortcoming POSSUM, a risk adjusted scoring system was proposed.

P-POSSUM, a modification of POSSUM, has been proposed as a better scoring system as it better correlates with the observed mortality rate. But P-POSSUM has to be correlated to the general condition of the local population for it to be effective. This is especially true in patients in developing countries like India where the general health of the population is poor, malnutrition is a common problem and presentation frequently delayed . In our study we assessed the validity of P-POSSUM in 100 major gastrointestinal surgeries by comparing the observed mortality rate with expected mortality rate. 14 patients died (mortality rates of 9% (elective) and 20% (emergency), the total crude mortality rate being 14%). Tekkis and others obtained similar results (elective = 3.9%, emergency 25%and overall mortality rate of 11.1%)15. However on using P-POSSUM the expected mortality rate was 15 deaths. On analysis, there

was found to be no statistically significant difference between the observed and expected mortality rates (*x2* = 1.667, 9 d.f., p = 0.9957). An O: E ratio of 0.93 was obtained. Similar findings were obtained by Yii MK and Ng KJ19 (O: E = 1.28), Tekkis15 (O: E = 0.98)and Mohil 20(O: E = 0.66, *x*2 = 5.33, 9 d.f., p =0.619). Hence P-POSSUM was able to accurately predict the adverse outcome following major surgery in our study. analysing the risk factors we found positive rate of increment with all the risk factors studied but it was found to be statistically significant with respect to malignancy (p =0.0265), total blood loss (p= 0.0321), serum sodium (p =0.0329), blood urea (p =0.004) and white cell count (p =0.019). Various factors like decreased immunity and cachexia resulting from malignancy, ischemia and impaired haemostasis resulting from blood loss, uraemia resulting in decreased healing rates, impaired immunity, leucocytosis correlating with the degree of inflammation, toxaemia, hyponatremia resulting into impaired physiological response could be attributed to the effect of these factors on post operative mortality rate. Therefore adequate and prompt correction can definitely be expected to cause a decrease in adverse outcome rates.

Tekkis and others found that total blood loss was not significant enough to alter their statistical analysis in their study but their study predominantly involved elective cases (66%) in a super speciality setting. Wound infection (92 cases, 34%) and chest infections (71 cases, 26%) accounted for the majority of complications. Similar results were obtained by

Mohil RS (35% and 20% respectively).Wound infections could be attributed to the large number of patients who had gross peritoneal contamination resulting from hollow visceral perforation resulting in local contamination of the incision site. A raised diaphragm, upper abdominal incision and gross peritoneal contamination resulting into higher rates of chest infections in our group.

CONCLUSION

We studied 100 major general surgeries, both elective (56%) and emergency cases (44%), which resulted in 14 deaths (14% mortality rate). On applying PPOSSUM we found that the expected number of deaths for our study group was 29 (O: E = 0.96). We found no difference between expected and observed mortality rates. The present study suggests that P-POSSUM is an accurate scoring system for predicting post operative adverse outcome among patients undergoing major general surgeries.

The complications of wound infection and chest infection are a concern and require better care for their prevention following major general surgeries. All the studied risk factors were found to have a positive rate of increment of deaths with higher scores. Presence of malignancy, total blood loss, serum sodium levels and blood urea levels and leukocytosis were found to be significant in our study. Hence adequate and prompt correction of these factors could decrease the mortality rate.This study therefore validates P-POSSUM as a valid means of assessing adequacyof care provided to the patient. P-POSSUM can be used for surgical audit to assess and improve the quality of surgical care and result in better outcome to the patient.

SUMMARY

A total of 100 major surgical operations were studied in patients admitted in general surgery department of Rajiv Gandhi Govt. General Hospital,Chennai, during the period of July 2012 to Dec 2012. The study group consisted of 56 elective and 44 emergency cases. Duodenal perforation (14 cases), malignancy (30 cases), intestinal obstruction (5 cases), Ileal perforation (11 cases), gastric perforation (4 cases), appendicular perforations (4), obstructed hernia (2 cases), open cholecystectomy (13 cases),gastric outlet obstruction and others (11 cases) were the indications for which the patients were subjected for surgery. They were scored using P-POSSUM scoring system, physiological scoring was done at the time of admission and operative scoring was done intraoperatively. They were followed up for the first 30 day post operative period for any complications and the outcome was noted. The observed mortality rate was compared with the P-POSSUM expected mortality rate. 14 patients died (mortality rates of 9% (elective) and 20% (emergency), the total mortality rate of 14%) The P-POSSUM expected mortality rate was 15% deaths. An O: E ratio of 0.93 was obtained. There was no statistical difference between the observed and P-POSSUM predicted mortality rates ($x2$ = 1.667, 9 d.f., p = 0.9957). On analysing the risk factors we found positive rate of increment with all the risk factors studied but it was found to be statistically significant with

respect to malignancy (p =0.0265), total blood loss (p= 0.0321), serum sodium (p =0.0329), blood urea (p =0.004) and white cell count (p =0.019).

Wound infection (22cases,16 %) and chest infections (15 cases, 10%) accounted for the majority of complications.

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APPENDIX I

PROFORMA

1. NAME : I.P.No :

2. AGE : UNIT :

3. SEX : D.O.A. :

4. RELIGION : D.O.O. :

5. OCCUPATION : D.O.D. :

6. RESIDENCE :

PHYSIOLOGICAL SCORING

1.AGE

2.CARDIAC SIGNS

Chest Radiograph

3.RESPIRATORY HISTORY

Chest Radiograph

4.BLOOD PRESSURE (systolic)

5.PULSE

6.GLASGOW COMA SCALE

7.HEMOGLOBIN(g/100 ml)

8.WHITE BLOOD CELL COUNT

9. UREA (mmol/L)

10. SODIUM (mmol/L)

11. POTASSIUM (mmol/L)

12. ELECTROCARDIOGRAM

OPERATIVE SEVERITY SCORE

1.OPERATIVE SEVERITY

2.MULTIPLE PROCEDURES

3.TOTAL BLOOD LOSS

4.PERITONEL SOILING

5.PRESENCE OF MALIGNANCY

6. MODE OF SURGERY

MORTALITY

P-POSSUM (Predicted) :

Actual : **(Yes/No)**

COMPLICATIONS RECORD SHEET

- **NAME :**
- **I.P.No :**
- **DIAGNOSIS :**
- **OPERATION :**
- **OUTCOME :**
- Haemorrhage
- Wound
    - Deep
    - Other
- Infection
    - Chest
    - Wound
    - Urinary tract
    - Deep
- Septicaemia
- Pyrexia
- Other

- Wound dehiscence

  Superficial

  Deep

- Anastomotic leak

- Thrombosis

  Deep vein thrombosis

  Pulmonary embolus

  Other

  Cerebrovascular accident

  Myocardial infarct

- Cardiac failure
- Impaired renal function

- (Urea increase > 5mmol/l,from preoperative level)
- Hypotension (< 90mmHg for 2h)
- Respiratory failure
- Any other complication
- In the event of death give date

Annexure:

Master Chart

10 S.no	Name	IP no	DOA	SEX	AGE	CVS	RS	BP	PR	GCS	Hb	WBC	UREA	Na+	K+	ECG
1.	Ananthi	94957	01.07.12	M	1	1	8	4	8	1	4	4	2	2	2	1
2.	Sekar	97806	05.07.12	M	1	1	1	1	2	1	1	1	1	1	1	1
3.	Anil	98129	06.07.12	M	1	1	2	1	1	1	2	1	1	1	1	1
4.	Kannan	94995	07.07.12	M	1	1	1	1	1	1	1	1	1	1	1	1
5.	Sundaram	98533	07.07.12	M	2	1	2	2	4	1	4	4	1	1	1	1
6.	Nagappan	94994	10.07.12	M	1	1	1	1	1	1	2	2	1	1	1	1
7.	Kannammal	89570	10.07.12	M	2	1	2	1	2	1	8	2	1	1	2	1
8.	Kumar	87770	29.07.12	M	1	2	1	1	2	1	4	1	1	2	1	1
9.	Vasantha	93954	18.07.12	F	2	1	2	8	2	1	1	1	2	1	1	1
10.	Kuppusamy	99498	16.07.12	M	1	1	1	1	1	1	4	1	2	1	1	1
11.	Uppender	99628	06.08.12	M	1	1	1	1	1	1	2	1	2	1	2	1
12.	Arumugam	97721	31.07.12	M	1	1	4	1	1	1	2	2	1	1	1	1
13.	Murugammal	99017	04.08.12	F	1	1	1	1	1	1	2	1	1	2	1	1
14.	Manjula	100001	08.08.12	F	1	1	1	1	2	1	8	1	1	1	1	1
15.	Lakshmi	94076	19.08.12	F	1	1	4	1	1	1	8	4	1	1	1	1
16.	Sekar	99929	26.08.12	M	1	1	1	1	2	1	4	1	1	2	1	1
17.	Chandra	99522	06.08.12	F	2	4	2	2	4	1	4	1	1	1	2	1
18.	Lakshmi	100756	09.08.12	F	2	1	2	1	2	1	8	2	1	1	1	1
19.	Selvi	97505	31.08.12	F	1	1	1	1	1	1	2	1	1	1	1	1
20.	Venkatesh	97039	29.08.12	M	1	2	4	8	8	1	4	4	2	2	4	8
21.	Loganathan	100831	10.08.12	M	1	1	1	1	1	1	2	2	1	1	1	1
22.	Vinoth	101009	10.08.12	M	1	1	1	1	1	1	1	2	1	1	1	1
23.	Varadhaiah	85942	23.08.12	M	1	1	1	1	4	1	2	2	1	1	2	1
24.	Malliga	100902	09.08.12	M	1	1	1	1	1	1	1	4	1	1	1	1
25.	Madhavan	101843	13.08.12	M	1	1	4	8	4	1	2	2	8	2	2	1
26.	Barathi	101721	12.08.12	F	1	1	2	1	1	1	2	1	1	1	1	1
27.	Dhayalan	95955	26.08.12	M	1	1	1	1	1	1	2	1	1	1	1	1
28.	Paneerselvam	102239	14.08.12	M	1	4	8	1	2	1	2	2	2	2	4	1
29.	Yogesh	102475	14.08.12	M	1	1	1	1	1	1	2	1	1	1	1	1
30.	Mari	103113	16.08.12	M	1	1	1	1	1	1	1	1	1	4	1	1
31.	Kumar	100892	10.08.12	M	1	2	2	1	4	1	1	1	1	1	1	1
32.	Perumal	103880	18.08.12	M	1	1	8	1	1	1	1	1	8	1	1	1
33.	Aruldoss	103684	18.09.12	M	1	1	1	1	1	1	4	1	1	1	1	1
34.	Munusamy	104308	20.09.12	M	1	2	2	1	2	1	2	4	1	1	1	1
35.	Sulochana	96550	28.09.12	F	1	1	1	1	1	1	8	1	4	1	1	1
36.	Adhilakshmi	90802	08.09.12	F	1	1	2	1	2	1	8	1	1	1	1	1
37.	Sekar	104769	21.09.12	M	1	2	1	1	1	1	4	2	1	1	1	1
38.	Muniyammal	104753	21.09.12	F	1	1	1	1	1	1	4	1	2	4	1	1
39.	Ramesh	104821	21.09.12	M	1	1	1	1	2	1	4	2	4	1	1	1
40.	Kumar	105152	22.09.12	M	1	1	1	1	1	1	1	2	1	1	1	1
41.	Dhivya	102249	14.09.12	F	1	1	1	1	2	1	4	1	2	1	1	1
42.	Malathi	103798	18.09.12	F	1	1	1	1	1	1	4	1	1	1	1	1
43.	Raju	106147	25.09.12	M	1	2	2	1	1	1	8	4	8	2	1	1
44.	Munusamy	106247	26.09.12	M	2	1	2	2	2	1	2	1	1	1	2	1
45.	Rani	106466	27.09.12	F	1	1	1	1	1	1	1	2	1	1	1	1

46.	Vishalatchi	107289	29.09.12	F	2	2	2	4	4	1	4	4	4	2	2	8
47.	Thangavelu	94966	21.09.12	M	1	1	1	1	1	1	1	1	2	1	1	1
48.	Kamala	103182	16.09.12	F	1	1	1	1	1	1	2	1	1	1	1	1
49.	Murugananda	102586	01.10.12	F	1	1	4	1	1	1	4	1	2	2	1	1
50.	Vimala	99062	04.09.12	F	1	1	1	1	8	1	1	4	1	1	1	1
51.	Samsu beevi	100459	09.09.12	F	4	4	4	2	1	1	4	4	4	2	2	8
52.	Joseph	106251	26.09.12	M	2	1	2	1	2	1	8	1	1	1	1	1
53.	Logu	107781	01.10.12	M	1	1	1	1	1	1	4	1	1	1	1	1
54.	Mahendran	108695	04.10.12	M	2	4	4	1	2	1	4	4	8	2	2	8
55.	Gopal	100624	09.10.12	M	1	1	1	1	1	1	4	1	1	1	1	1
56.	Velu	109093	05.10.12	M	1	1	1	1	1	1	2	1	1	1	1	1
57.	Kabali	108993	01.10.12	M	1	1	1	1	1	1	2	1	1	2	1	1
58.	Rangaraj	109154	05.10.12	M	1	1	4	1	2	1	1	1	8	2	1	1
59.	Murugan	109224	06.10.12	M	1	1	1	1	1	1	4	1	1	1	1	1
60.	Amos	103362	17.10.12	M	1	1	8	1	1	1	4	1	1	1	1	1
61.	Chinnavedi	109827	07.10.12	M	1	1	1	1	2	1	2	1	2	1	1	1
62.	Subbammal	99184	04.10.12	F	1	1	2	1	1	1	2	1	2	1	1	1
63.	Anjalai	110171	08.10.12	F	1	1	2	1	2	1	2	1	1	1	2	1
64.	Dharmalingam	92714	14.10.12	M	1	1	1	1	1	1	4	1	2	1	1	1
65.	Devandraraj	110523	10.10.12	M	1	1	1	1	1	1	2	1	2	1	2	1
66.	Selvam	110637	10.10.12	M	2	2	4	2	2	1	8	2	4	4	1	8
67.	Govindharaj	110708	10.10.12	M	1	1	1	1	1	1	4	1	2	1	1	1
68.	Sasikumar	110795	11.10.12	M	1	1	1	1	1	1	2	1	2	1	2	1
69.	Rajeshkannan	110885	11.10.12	M	1	1	4	1	1	1	2	1	1	1	1	1
70.	Parvathi	108231	21.10.12	F	1	1	1	1	4	1	8	1	4	8	2	1
71.	Gopal	111637	13.10.12	M	2	4	2	4	2	1	4	1	2	1	2	1
72.	Ponni	105233	23.10.12	F	1	1	1	1	1	1	4	1	1	1	4	1
73.	Munusamy	112782	16.10.12	M	2	1	2	1	2	1	2	1	2	1	2	1
74.	Anandhan	112980	17.10.12	M	1	1	4	1	1	1	4	2	4	4	8	1
75.	Shanmugam	113046	18.10.12	M	1	1	1	1	1	1	2	1	1	1	1	1
76.	Kamala	112008	27.10.12	F	1	1	1	1	2	1	8	1	4	1	2	1
77.	Chinnasamy	106854	20.10.12	M	1	1	1	1	1	1	4	1	1	1	2	1
78.	Kannan	113671	19.10.12	M	4	2	4	4	2	1	4	2	2	8	4	8
79.	Valli	109435	22.10.12	F	1	1	1	1	1	1	8	1	1	1	1	1
80.	Chellappan	113185	24.10.12	M	2	2	2	4	4	1	2	1	1	1	2	8
81.	Ramana	114040	27.10.12	M	1	1	1	1	1	1	2	1	1	1	2	1
82.	Rajamoorthy	107748	01.11.12	M	1	1	1	1	1	1	2	1	1	8	4	1
83.	Sundarambal	111206	03.11.12	F	2	2	2	4	2	1	4	1	2	1	1	8
84.	Dhanapal	108021	05.11.12	M	1	1	1	1	1	1	4	1	1	1	2	1
85.	Trameema	114672	06.11.12	F	1	1	1	1	1	1	4	1	1	1	2	1
86.	Rajendran	114973	09.11.12	M	1	1	4	1	1	1	4	1	2	1	1	1
87.	Ravi	114981	15.11.12	M	1	1	1	1	1	1	4	1	1	1	2	1
88.	Mujper rahman	115066	12.11.12	M	1	1	1	1	1	1	2	1	1	1	4	1
89.	Baskar	113409	18.11.12	M	1	1	2	1	1	1	2	1	4	1	1	1
90.	Meena	109657	21.11.12	M	1	1	1	1	1	1	4	1	2	1	1	1
91.	Rajendran	114973	25.11.12	M	1	1	1	1	1	1	2	1	2	1	2	1
92.	Munusamy	106297	27.11.12	M	2	2	4	2	4	1	8	1	2	1	2	8
93.	Seetha	116104	30.11.12	F	1	1	1	1	1	1	4	1	1	1	1	1
94.	Murugan	116727	02.12.12	M	1	1	1	1	1	1	2	1	4	2	1	1
95.	Dharmalingam	92714	04.12.12	M	1	1	1	8	1	1	4	2	1	4	8	8
96.	Chellappan	113785	04.12.12	M	2	2	2	4	2	1	8	1	1	1	1	1
97.	Parameshwari	117108	09.12.12	F	1	8	8	4	1	1	8	4	4	8	4	1
98.	Munusamy	117222	12.12.12	M	1	1	1	1	1	1	2	1	1	1	1	1

99.	Lakshmidevi	154	16.11.12	F	1	1	1	1	2	1	4	1	1	1	1
100.	Natesan	169	10.12.12	M	1	1	1	1	2	1	4	1	1	1	2	1

S.NO	Name	Severity	Multiple	TBL	Per	Mal	Mode	TS	Obs
1.	Ananthi	4	1	8	2	8	1	62	+
2.	Sekar	4	1	2	8	1	4	33	-
3.	Anil	4	1	2	4	1	4	30	-
4.	Kannan	4	1	1	8	1	4	31	-
5.	Sundaram	4	1	1	2	1	1	34	-
6.	Nagappan	4	1	1	1	1	4	26	-
7.	Kannammal	4	1	2	1	2	4	38	-
8.	Kumar	4	1	2	8	1	4	38	-
9.	Vasantha	4	1	2	8	1	1	40	-
10.	Kuppusamy	4	1	1	1	2	1	26	-
11.	Uppender	4	1	1	2	2	1	26	-
12.	Arumugam	4	1	2	1	1	4	30	-
13.	Murugammal	4	1	1	1	1	1	23	-
14.	Manjula	4	1	2	4	1	4	36	-
15.	Lakshmi	4	1	8	1	1	1	41	-
16.	Sekar	4	1	1	1	1	1	26	-
17.	Chandra	4	1	2	2	1	4	39	-
18.	Lakshmi	4	1	8	1	2	1	40	-
19.	Selvi	4	1	2	4	1	1	26	-
20.	Venkatesh	4	1	1	1	1	1	57	+
21.	Loganathan	4	1	1	4	1	4	29	-
22.	Vinoth	4	1	2	1	1	4	26	-
23.	Varadhaiah	4	1	1	2	1	1	28	-
24.	Malliga	4	1	1	4	2	1	28	-
25.	Madhavan	4	4	1	8	1	4	58	+
26.	Barathi	4	1	2	1	1	1	24	-
27.	Dhayalan	4	1	2	1	1	4	26	-
28.	Paneerselvam	4	1	1	8	1	4	49	+
29.	Yogesh	4	1	1	1	1	4	25	-
30.	Mari	4	1	2	2	1	1	26	-
31.	Kumar	4	1	2	1	1	1	27	-
32.	Perumal	4	1	1	8	1	4	45	-
33.	Aruldoss	4	1	1	1	1	1	24	-
34.	Munusamy	4	1	1	2	1	1	29	-

35.	Sulochana	4	1	2	1	1	1	32	-
36.	Adhilakshmi	4	1	4	1	8	1	40	-
37.	Sekar	4	1	1	8	1	4	36	-
38.	Muniyammal	4	1	2	1	1	4	32	-
39.	Ramesh	4	1	1	1	1	4	32	-
40.	Kumar	4	1	1	1	1	1	22	-
41.	Dhivya	4	1	1	4	1	1	29	-
42.	Malathi	4	1	1	1	1	1	24	-
43.	Raju	4	1	1	8	1	1	48	+
44.	Munusamy	4	1	1	1	4	4	33	-
45.	Rani	4	1	1	8	1	4	32	-
46.	Vishalatchi	4	1	1	8	1	4	58	+
47.	Thangavelu	4	1	2	1	4	1	26	-
48.	Kamala	4	1	1	1	1	1	22	-
49.	Murugananda	4	1	1	1	2	1	30	-
50.	Vimala	4	1	1	4	2	1	35	-
51.	Samsu beevi	4	1	4	1	2	1	53	+
52.	Joseph	4	1	1	2	2	1	33	-
53.	Logu	4	1	1	1	1	1	24	-
54.	Mahendran	4	1	1	8	1	4	61	+
55.	Gopal	4	1	1	1	1	1	24	-
56.	Velu	4	1	2	1	1	4	26	-
57.	Kabali	4	1	1	8	1	4	33	-
58.	Rangaraj	4	1	1	2	2	1	35	-
59.	Murugan	4	1	1	8	1	4	34	-
60.	Amos	4	1	1	1	1	1	31	-
61.	Chinnavedi	4	1	1	8	1	4	34	-
62.	Subbammal	4	1	1	1	1	1	24	-
63.	Anjalai	4	1	1	1	1	1	25	-
64.	Dharmalingam	4	1	1	8	1	4	35	-
65.	Devandraraj	4	1	1	1	2	1	25	-
66.	Selvam	4	1	1	8	1	4	59	+
67.	Govindharaj	4	1	1	8	1	1	32	-
68.	Sasikumar	4	1	1	1	1	4	27	-
69.	Rajeshkannan	4	1	1	8	1	4	35	-
70.	Parvathi	4	1	2	2	4	4	50	+
71.	Gopal	4	1	1	8	1	4	45	-
72.	Ponni	4	1	1	1	2	1	28	-
73.	Munusamy	4	1	4	1	8	1	37	-

74.	Anandhan	4	4	1	8	1	4	54	+
75.	Shanmugam	4	1	1	2	4	1	26	-
76.	Kamala	4	1	1	8	1	4	43	-
77.	Chinnasamy	4	1	1	1	1	1	25	-
78.	Kannan	4	1	4	4	4	1	63	+
79.	Valli	4	1	1	8	1	4	38	-
80.	Chellappan	4	1	1	8	1	4	49	-
81.	Ramana	4	1	1	8	1	4	33	-
82.	Rajamoorthy	4	1	2	1	2	1	34	-
83.	Sundarambal	4	1	2	1	4	1	43	-
84.	Dhanapal	4	1	4	2	2	1	30	-
85.	Trameema	4	1	1	1	1	1	25	-
86.	Rajendran	4	1	1	1	2	1	29	-
87.	Ravi	4	1	1	1	1	1	25	-
88.	Mujper rahman	4	1	1	1	4	1	28	-
89.	Baskar	4	1	1	1	4	1	29	-
90.	Meena	4	1	4	1	2	1	29	-
91.	Rajendran	4	1	1	1	1	1	24	-
92.	Munusamy	4	1	1	8	1	4	56	-
93.	Seetha	4	1	1	8	1	4	34	-
94.	Murugan	4	1	1	8	1	4	36	-
95.	**Dharmalingam**	4	1	1	8	1	4	59	+
96.	Chellappan	4	1	1	8	1	4	45	-
97.	**Parameshwari**	4	1	8	4	2	1	72	+
98.	Munusamy	4	1	4	1	2	1	26	-
99.	Lakshmidevi	4	1	1	8	1	4	35	-
100.	Natesan	4	1	1	1	2	1	27	-