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A Study On Changing Pattern Of Microbial Pathogens In Throat Secretion And It's Effect On Final Outcome Of Patients Being Operated Under General Anaesthesia

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Abstract:
Background*: Surgery is the treatment of injuries and disorders of the body by incision and manipulation, often with use of instruments and general anaesthesia is the medication used in with the purpose being loss of consciousness especially in major surgeries such as upper abdominal surgery general anaesthesia is required which has four components : amnesia(partial or total memory loss), analgesia(inability to feel pain), muscle relaxation and interruption of nerve propagation so that surgical trauma is not felt by the patient. This study reviews the changing pattern of microbial pathogen in the throat secretion and its final outcome in patients operated under general anaesthesia and the at-risk patients.*
Materials and Methods*: This observational prospective study includes data of 100 patients operated under general anaesthesia at GURUGOBIND SINGH HOSPITAL, JAMNAGAR IN PERIOD OF TWO YEARS FROM NOVEMBER 2017 TO OCTOBER 2019 is done in a government hospital affliated with a government medical college.*
Results*: Post operative pulmonary complications are common complication after cardiac complication and wound infection. It affects the 6th decade of life more commonly. Males are more commonly affected. The presentation of ppc is almost equal in form of URTI and LRTI. Klebsiella is the most common microbial pathogen found. Most of the patients encountered with PPC developed fever, cough, tachycardia, expectoration and hypoxemia. Limiting the duration of surgery to <3 hours, using a minimally invasive surgeryand using regional techniques can decrease the incidence of complications. Incidence of ICU shift was more in the patients who are operated for >3 hours than compared to those operated for < 3 hours. Sputum positivity for the organism is directly proportional to the development of PPC. In our study all patients who developed PPC were treated with IV antibiotics and patients with URTI and those with LRTI required oxygen support and physiotherapy in addition to IV antibiotics. One patient with broncoscopy for mucus plug removal. There is increased number of length of hospital stay found in who developed PPC as compared to those without PPC.*
Key Word*: General Anaesthesia; Post operative pulmonary complications; Microbial pathogens.*

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I. Introduction

Surgery is the treatment of injuries and disorders of the body by incision and manipulation, often with use of instruments and general anaesthesia is the medication used in with the purpose being loss of consciousness especially in major surgeries such as upper abdominal surgery general anaesthesia is required which has four components : amnesia(partial or total memory loss), analgesia(inability to feel pain), muscle relaxation and interruption of nerve propagation so that surgical trauma is not felt by the patient. Post operative pulmonary complications are a major cause of morbidity, mortality, prolonged hospital stay and increased cost of care. One broad definition of post operative complication (PPC) includes an identifiable disease or dysfunction. That is clinically relevant and adversely affects the clinical couse1,2. When the Pao2/Fio2 ratio is <300mmHg, it is ALI and when it is <200 mmHg, it is ARDS(American European Consensus Conference)3.This study reviews the changing pattern of microbial pathogen in the throat secretion and its final outcome in patients operated under general anaesthesia and the at-risk patients. We have focused on those which are relevant to clinical practice in GURUGOBIND SINGH HOSPITAL, JAMNAGAR from the time duration of 2017 to 2019 admitted in the surgery department.

II. Material And Methods

This observational prospective study includes data of 100 patients operated under general anaesthesia at GURUGOBIND SINGH HOSPITAL, JAMNAGAR IN PERIOD OF TWO YEARS FROM NOVEMBER 2017 TO OCTOBER 2019 is done in a government hospital affliated with a government medical college.

Study Design: Prospective observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of General surgery, at GURUGOBIND SINGH HOSPITAL, JAMNAGAR, GUJARAT.

Study Duration: NOVEMBER 2017 TO OCTOBER 2019.

Sample size: 100 patients.

Subjects & selection method: As per protocol of this study various epidemiological data of the patients were recorded. Preoperative clinical exam records, previous medical disease and laboratory workup, immediate preoperative sputum microbiology, chest x-ray was done and documented in proforma. Postoperatively on day 2 sputum/ expectoration/ cough sample collection was done and senr for microbiological examination. results were documented and patients with positive results were further evaluated by laboratory workup i.e. complete blood count, CXR and repeat culture on pod 5. Patients with URTI/LRTI were diagnosed by standard definition including clinical symtomatology, laboratory parameters and/or CXR. Association of various epidemiological, clinical, disease and surgery related factors and their impact on the postoperative positive throat secretion culture/ URTI/ LRTI etc. were made out.

Inclusion criteria:

1. Patients operated under general anaesthesia during emergency and elective surgeries.

Exclusion criteria:

1. Patients of pediatric age group
2. Patients with head injury.
3. Patients who underwent tracheostomy.

Performa (10 Bold)

NAME:-
AGE/SEX:- MRD NO:-

DATE OF ADMISSION:-
DATE OF OPERATION:-
DATE OF DISCHARGE:-
POSTOPERATIVE STAY:-
DIAGNOSIS:-

PAST HISTORY:-
POSITIVE MEDICAL HISTORY:
PERSONAL HISTORY:-
H/O SMOKING/BETELNUT CHEWING/ ALCOHOL/ OTHERS
H/O URTI/LRTI: YES/NO

GENERAL EXAMINATION:-
PALLOR/CYANOSIS/CLUBBING/EDEMA/JAUNDICE
POOR ORAL HYEIGINE/ DENTAL CARIES

RISK FACTORS FOR PULMONARY COMPLICATIONS:-

PRE-OPERATIVE SPUTUM
PRE OPERATIVE CXR:
MICROBIOLOGY EXAMINATION:-
CULTURE AND SENSITIVITY :-
ASA GRADE:

SURGICAL PROCEDURE:
METHOD OF INTUBATION:
TIMING OF EXTUBATION:-
DURATION OF SURGERY:-
CLINICAL COMPLAINTS [POST OPERATIVE COMPLICATIONS]

1. SORE THROAT – YES/NO
2. POST OP FEVER- YES/NO
3. TACHYCARDIA: YES/NO
4. SPO2 MONITORING- HYPOXAEMIA YES/NO
5. EXPECTORATION- PRESENT/ABSENT
6. WOUND INFECTION- SURGICAL SITE INFECTION PRESENT/ABSENT

ICU ADMISSION:-YES/NO

BIOCHEMICAL INVESTIGATIONS
1. COMPLETE BLOOD COUNT –
LEUCOCYTOSIS/LEUCOPENIA/NORMAL

2. URINE MICROSCOPY
SPUTUM CULTURE SENSITIVITY:-
POD 2
POD 5
POST OPERATIVE ANTIBIOTICS
RADIOLOGICAL FINDINGS
CXR REPORTING
POSTOPERATIVE PULMONARY COMPLICATION:
IF YES THEN
1. PNEUMONIA
2. ATELECTASIS
3. URTI
4. LRTI
5. LUNG ABSCESS
6. VAP
ANY OTHER POSTOPERATIVE MORBIDITY:

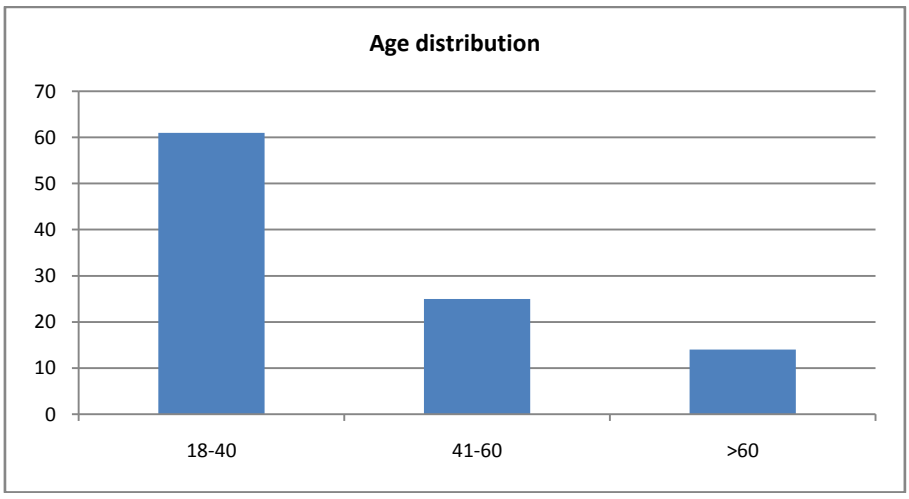
POST OP DURATION OF HOSPITAL STAY
MORTALITY: PRESENT/ABSENT

III. Result

This randomized study conducted on 100 patients Operated under general anesthesia for major surgery. They were admitted to surgery department.Following observations were made after evaluation of different epidemiological factors, etioclinicopathological factors, serial clinical variables and radiological findings.

TABLE - 1 EPIDEMIOLOGICAL FACTOR AGE DISTRIBUTION.

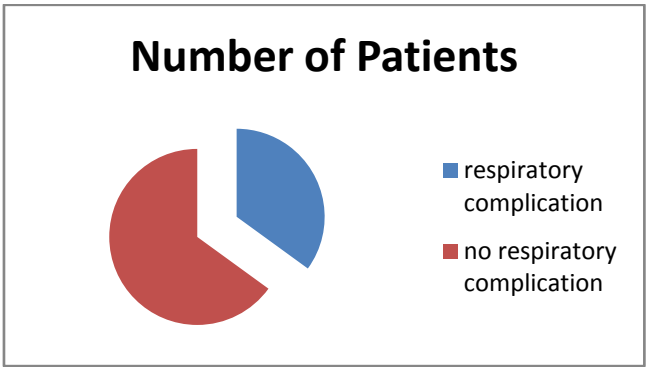
AGE(IN YEARS)	NUMBER OF PATIENTS
18-40	61
41-60	25
> 60	14



In this study out of 100 patients 61 patients were in 16-40 years age group, 25 patients were of 41-60 year age group, 14 patients were of 61-80 year age group. No patient were in their extremes of age. This statistically indicates that the productive age group of the society is relatively more frequently getting involved in surgeries done under general anaesthesia.

TABLE 2: PREVALENCE OF PPC

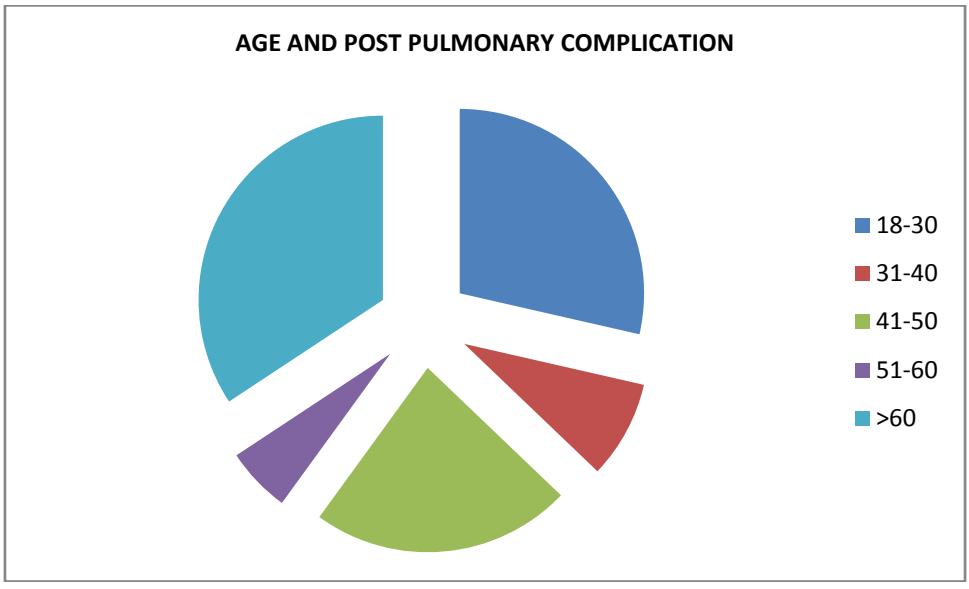
Clinical events	Number of Patients
respiratory complication	35
no respiratory complication	65



Out of 100 patients 35(35%) of patients developed post pulmonary complications and rest of the 65(65%) had no any respiratory complaints.

TABLE 3: AGE AND POST PULMONARY COMPLICATION

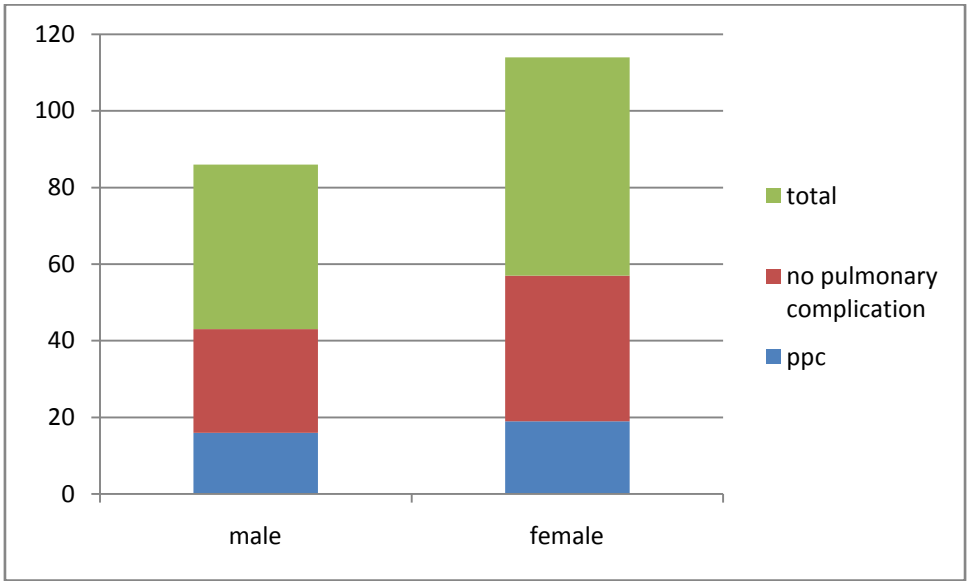
AGE	NO. OF PATIENTS
18-30	10
31-40	3
41-50	8
51-60	2
>60	12



Out of those who developed PPC 34.3% patients were >60 years suggesting that as the age increases chances of PPC are higher. The co-morbidities like anaemia, diabetes, renal impairment and aging process itself may be the reasons for the same.

TABLE NO 4: RELATIONSHIP OF SEX WITH POST PULMONARY COMPLICATION

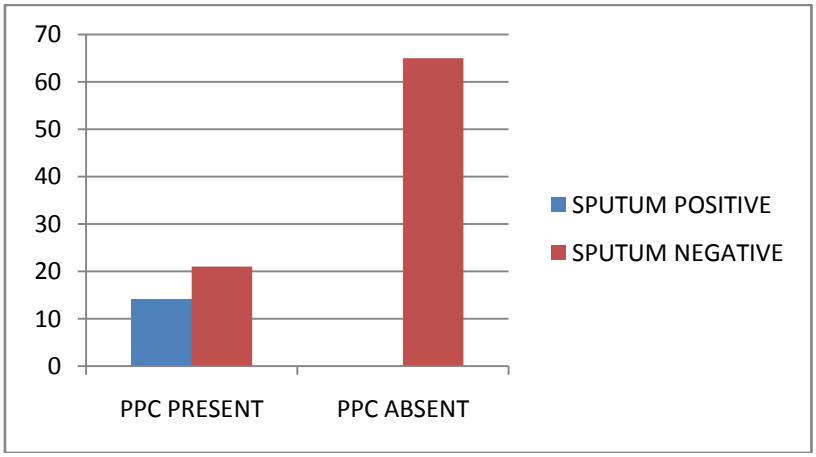
SEX	PPC	NOPULMONARY COMPLICATION	TOTAL
Male	16	27	43
Female	19	38	57



Out of 43 male patients 16(37.2%) developed PPC and out of 57 female patients 19(33.3%) developed PPCs.

TABLE 5: SPUTUM AND PPC CORRELATION

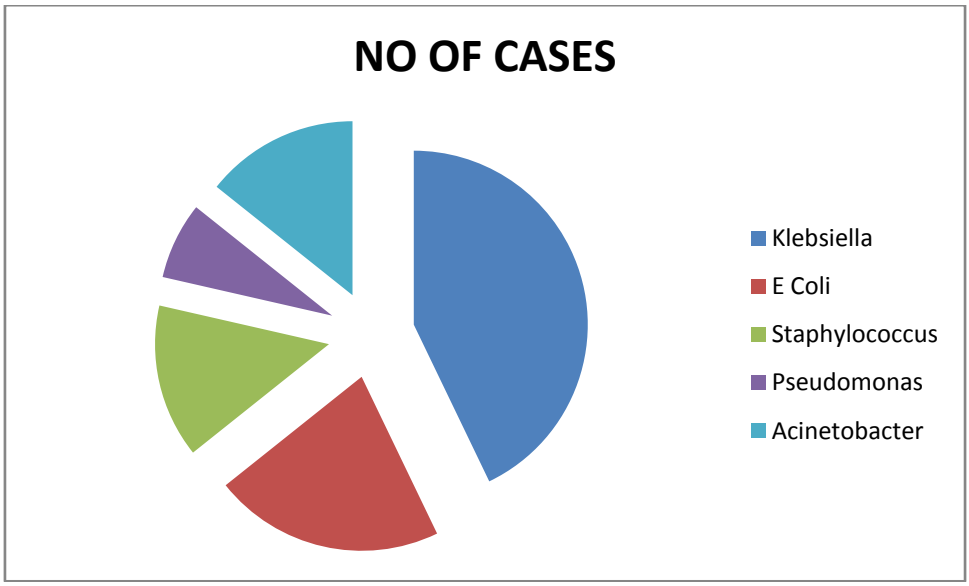
SPUTUM AND PPC	SPUTUM POSITIVE	SPUTUM NEGATIVE
PPC PRESENT	14	21
PPC ABSENT	0	65



From the above data it is clear that all sputum positive cases develop post pulmonary complication (100%) but the reverse was not true, as 60% of the post pulmonary complication patient had sputum negative, indicating a negative sputum post operatively, was not a reliable marker for the development of PPC.

TABLE 6: PREVALANCE OF MICROBIAL PATHOGEN IN THE THROAT SECRETION

Organism isolated	No of cases
Klebseilla	6
E coli	3
Staphylococcus	2
Pseudomonas	1
Acinatobacter	2

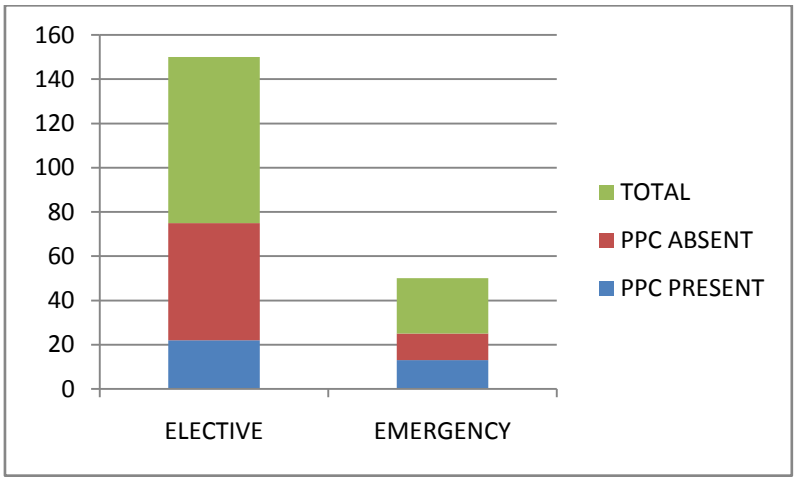


From our observation Klebseilla (42.85%) was found to the most common organism isolated from the throat secretion in our institute, followed by E coli (21.42%) followed by staphylococcus and acinetobacter shares same percentage 14.28% each and pseudomonas of 7.14%.

Most commonly occurring bacteria in throat secretion was gram negative bacilli (klebsiella).

TABLE 7: CORRELATION BETWEEN PPC AND THE TYPE OF OPERATION

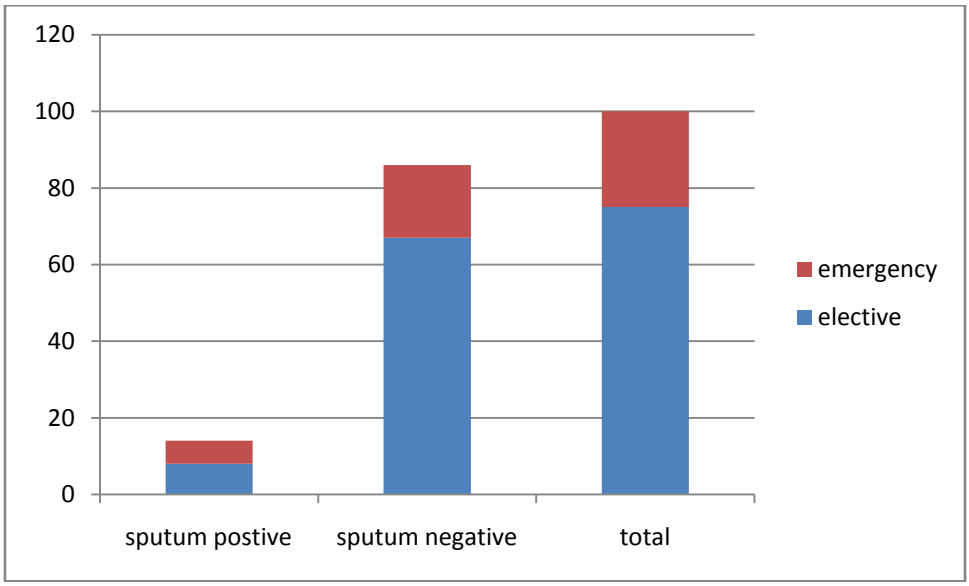
TYPE OF SURGERY	PPC PRESENT	PPC ABSENT	TOTAL
ELECTIVE	22	53	75
EMERGENCY	13	12	25



29.33% of elective operation developed ppc as compared to 52% of emergency operations, thus concluding that the chances of developing ppc are more common in emergency cases than elective. This may be because of poor general condition of the patient, lack of aspesis in emergency wards; operation theatres; and ICU's and at times shortage of staff.

TABLE 8: CORRELATION BETWEEN SPUTUM AND TYPE OF OPERATION

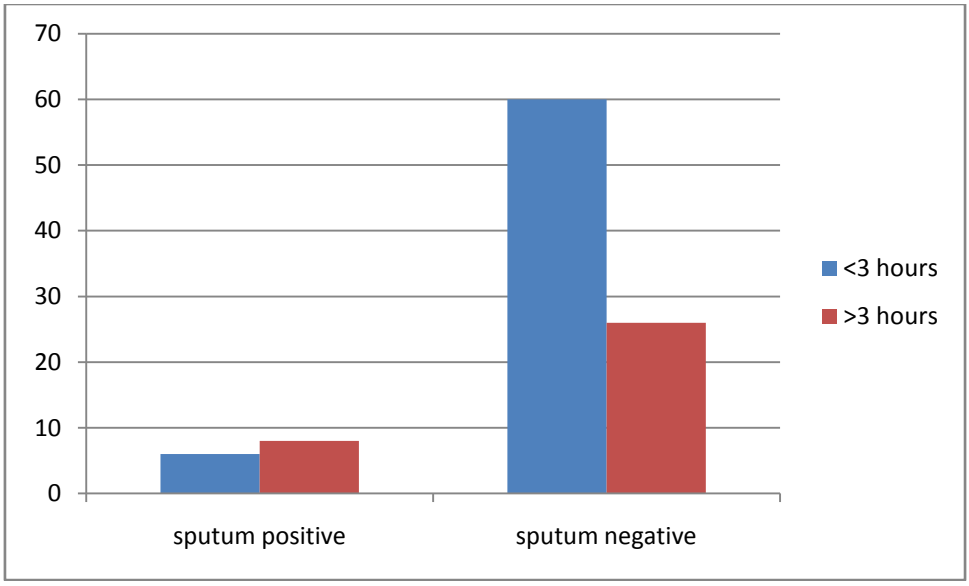
TYPE OF OPERATION	SPUTUM POSITIVE	SPUTUM NEGATIVE	TOTAL
Elective	8	67	75
Emergency	6	19	25



10.66% of electively operated patients developed positive sputum culture as compared to 24% of emergency operations, thus indicating that emergency operation has a higher operation has higher risks of developing sputum positive post pulmonary complications.

TABLE 9: CORRELATION BETWEEN SPUTUM POSTIVITY AND DURATION OF OPERATION

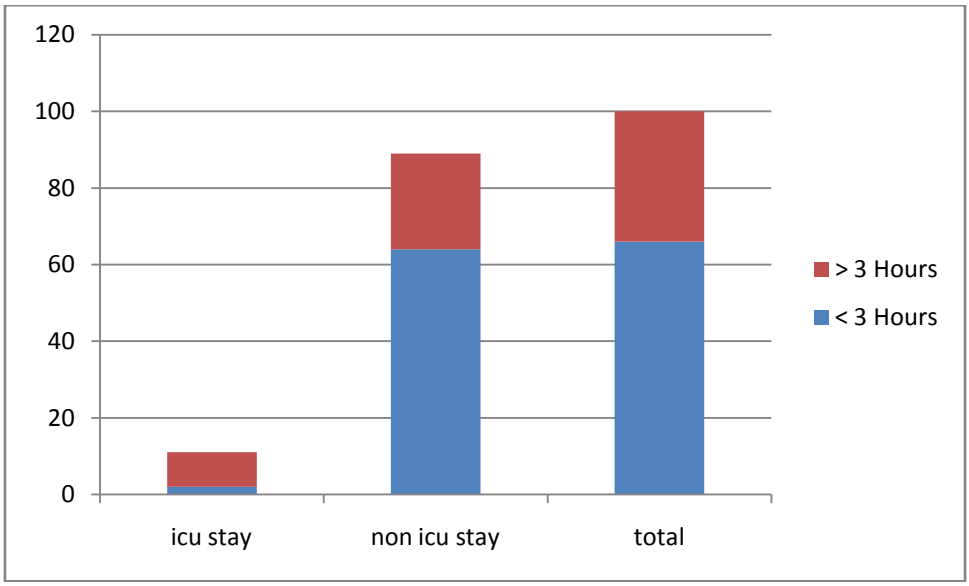
DURATION	SPUTUM POSITIVE	SPUTUM NEGATIVE
<3Hours	6	60
>3Hours	8	26



Out of 100 patients 66 were operated under duration of < 3hours and 34 patients operated >3 hours. Out of these 66 patients 6(9%) patients were sputum positive and rest were normal and for those who were operated for > 6 hours 8 (23.52%) patients were sputum positive and rest were sputum negative. This indicates that the longer the exposure of endotracheal tube, air from ventilator channels, muscle relaxant and supine posture the more will be the chance of sputum positive PPC.

TABLE 10: CORRELATION BETWEEN DURATION OF OPERATION AND ICU STAY

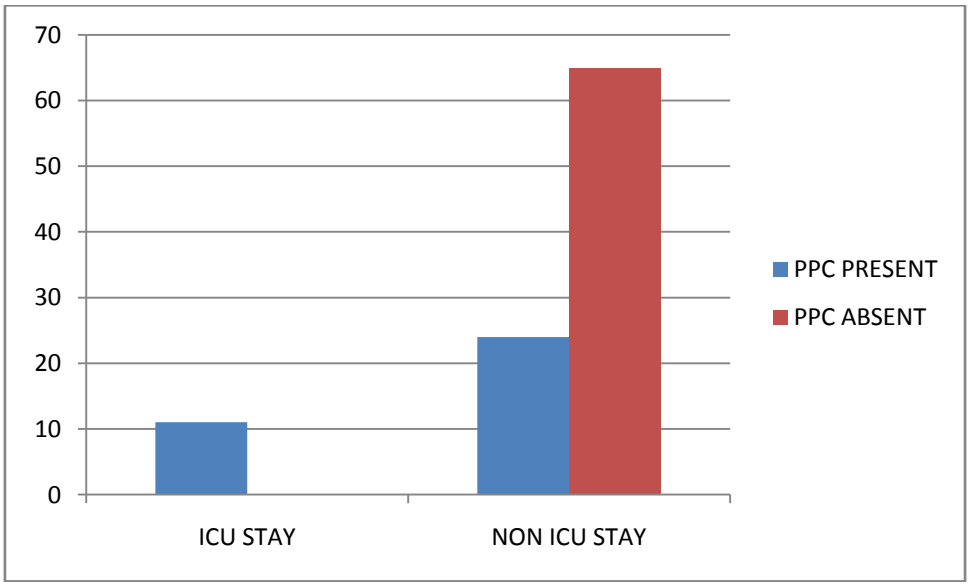
DURATION OF OT	ICU STAY	NON ICU	TOTAL
< 3 Hours	2	64	66
>3 Hours	9	25	34



81.8% of the ICU patients had duration of surgery > 3 Hours. 96.9% of patients who didn't required ICU stay in the post op period had a lesser duration of surgery (<3 Hours). Out of 34 patients with duration of surgery >3 hours, 9 i.e. 26.47% of the patients required ICU, while out of 66 patients with duration < 3 hours, 2 i.e. 3.03% of the patents require ICU stay. Thus implying lesser duration of surgery, lesser exposure to the anaesthesia and lesser risk of post op ICU stay.

TABLE 11: CORRELATION BETWEEN ICU STAY AND PPC

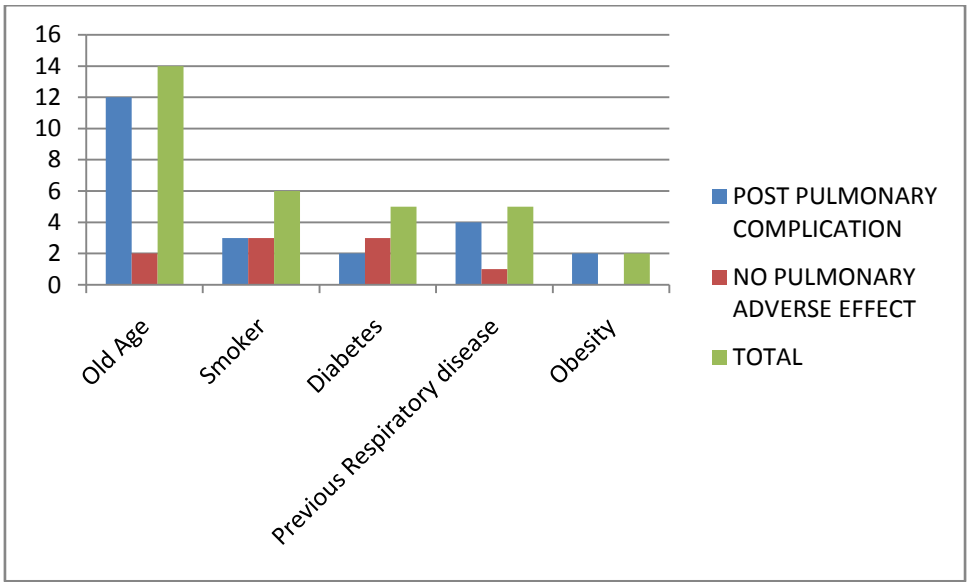
ICU AND PPC CORRELATION	PPC PRESENT	PPC ABSENT
ICU STAY	11	0
NON ICU STAY	24	65



Out of 35 patients who developed PPC, 11 i.e. 31.43% required ICU stay.

TABLE 12: COMORBID CONDITION AND POST PULMONARY COMPLICATIONS

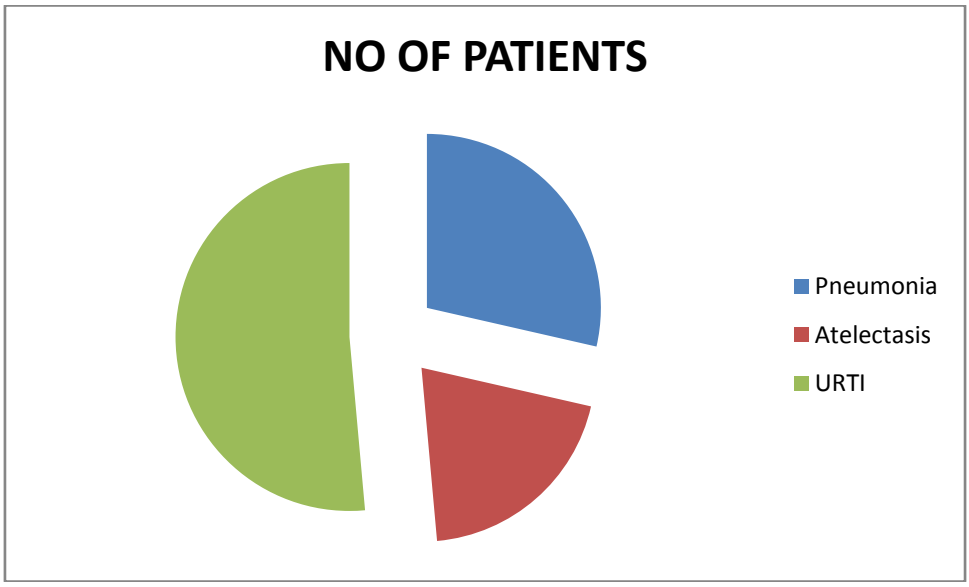
POST PULMONARY COMPLICATION	POST PULMONARY COMPLICATION	NO PULMONARY ADVERSE EFFECT	TOTAL
Old Age	12	2	14
Smoker	3	3	6
Diabetes	2	3	5
Previous Respiratory disease	4	1	5
Obesity	2	0	2



As mentioned above we considered various co-morbid conditions in our study. Out of 14 old age patients, 12 (i.e.85.71%), 6 smoker patients 3(i.e. 50%), 5 diabetic patients 2(i.e. 40%), 5 respiratory compromised patients 2(i.e. 80%) and 2 obese patients 2 (i.e100%) have developed PPC. But out of 35 patients who developed PPC 23 (i.e. 65.71%) had comorbidities while remaining 12 (i.e. 34.29%) had no co-morbidities and yet they developed PPC. This makes it even more dangerous.

TABLE 13: INCIDENCE OF POSTPULMONARY COMPLICATIONS

POST PULMONARY COMPLICATION	NO OF PATIENTS
Pneumonia	10
Atelectasis	7
URTI	18

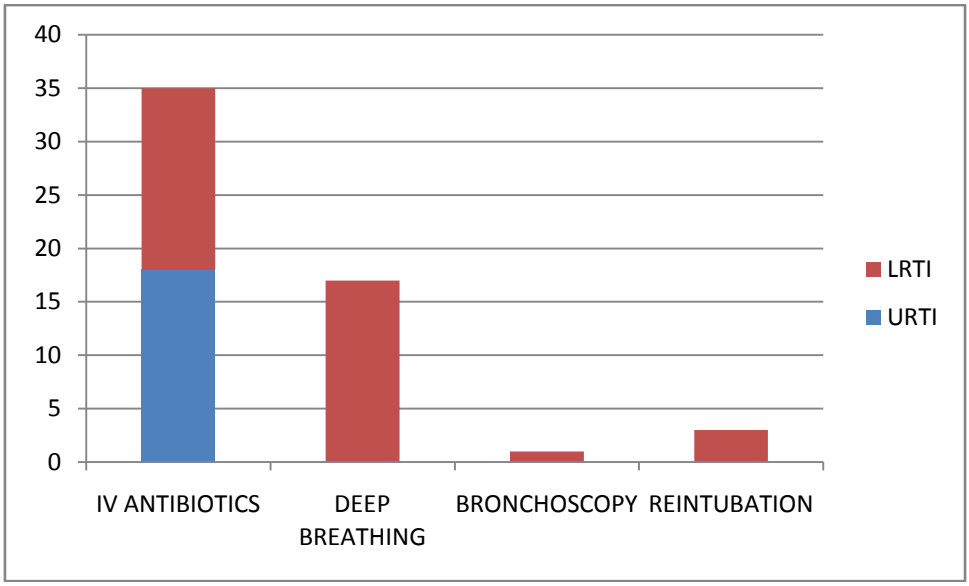


Out of 100 patients clinical data were evaluated and found that 35 (35%) patients presented with post op pulmonary complications. 10(28.6%) patients were having pneumonia, 7(20%) patients having atelectasis, 18(51.4%) patients having URTI. So the commonest of all is URTI.

TABLE 14: MANAGEMENT OF PPC

MANAGEMENT	URTI	LRTI
IV ANTIBIOTICS	18	17
DEEP BREATHING	0	17
BRONCHOSCOPY	0	1

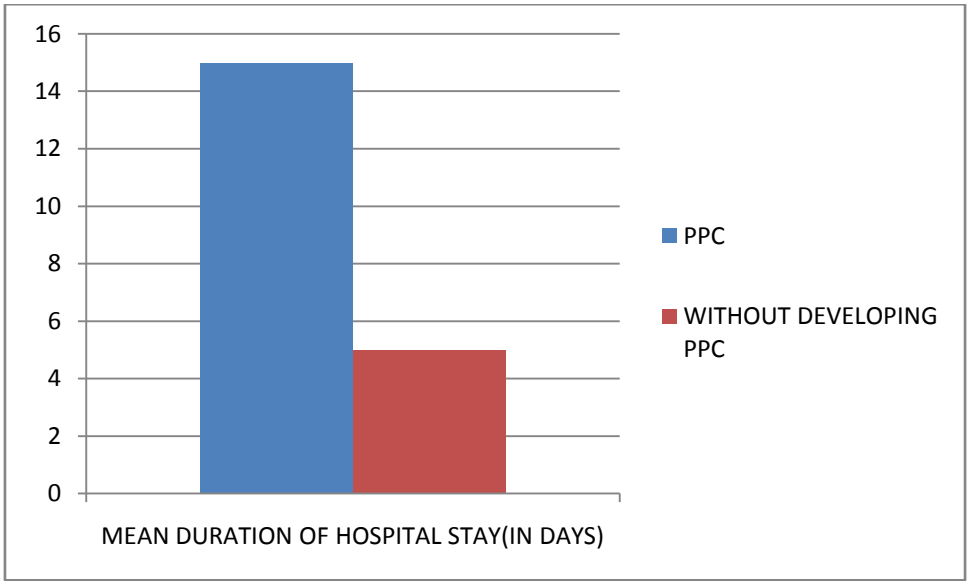
REINTUBATION	0	3



In our study IV antibiotics were the main stay treatment of PPC in the URTI as well as LRTI. Adjuvant broncoscopy, deep breathing exercise and reintubation was used in the treatment of LRTI. All 100% URTI were treated with IV antibiotics while LRTI requires more than IV antibiotics in form of reintubation was required in 8.57%, while bronchoscopy was required in 2% and deep breathing exercise was required in 48% of patients who developed PPC.

TABLE 15: DURATION OF HOSPITAL STAY

CONDITION OF PATIENTS	MEAN DURATION OF HOSPITAL STAY(IN DAYS)
PPC	15
WITHOUT DEVELOPING PPC	05



In our study 35 patients who developed PPC have a mean hospital stay of 15 days while 65 patients without PPC have mean hospital stay of 5 days only. This indicated proportionality.

TABLE 16: OUTCOME

OUTCOME	POST PULMONARY COMPLICATION	NO OF PATIENTS(N= 10PO0)
Post pulmonary complication	Pneumonia	10
	Atelectasis	07
	URTI	18

Death	3
Discharge	97

There are 35 patients who developed post operative complication in form of URTI or LRTI and out of which 3 patients died. Others were discharged from the ward. This emphasizes aggressive multidisciplinary approach.

IV. Discussion

Post pulmonary complication share a major bulk in patients operated for various surgeries; third in number after wound infection and urinary tract infection, in any healthcare set up worldwide. The pateints of various age groups may get involved and presentation may vary from sore throat to hypoxaemia.

As the productive age group of the society involves more in general anaesthesia for various surgeries. We did this study at a tertiory health care setup. After lying down our observations we compared our findings with other studies available in literature. We got the following:

COMPARISION OF SEX INCIDENCE WITH OTHER STUDIES

SEX	MALE	FEMALE
FINLAY ET AL	50%	50%
McALISTER ET AL	50%	50%
ANA CAROLOINE DI ET AL	34.5%	65.6%
NERTILA KODRA ET AL	59.3%	40.7%
PRESENT STUDY	37.2%	33.3%

Above findings of various studies suggest post pulmonary complications more commonly affects males possible explanation being men tend to breathe more with their diaphragm and women more with their thorax so movements of diaphragm are restricted after abdominal operations and males suffer more from PPCs.

COMPARISION OF INCIDENCE OF PPC WITH OTHER STUDIES

PPC	INCIDENCE
TOORIE ET AL	8%
FINLAY ET AL	5%
MEDEIROS ET AL	33.9
FISHER ET AL	37%
KANAT ET AL	58.5%
PRESENT STUDY	35%

The above mentioned statistics clearly depict a wide range of PPC incidence because of difference in patient population, infrastructure set up of the hospital and the criteria used to define the PPC in different population. But the incidence was between 9-40%.

COMPARISION OF INCIDENCE VARIOUS PPC WITH OTHER STUDIES

STUDY	PNEUMONIA	ATELECTASIS	URTI
TOORIE ET AL	16%	21.33%	46.2%
MODELL ET AL	45%	-	-
MEDEIROS ET AL	37.2%	24.5%	-
PRESENT STUDY	28.5%	20%	51.4%

Post operative pneumonia is the most serious complication occurred in 9-40% of the patients after surgery. It ranks as the third most common postoperative infection, behind urinary tract and wound infection in hospitals. Accordingly, in this study postoperative pneumonia was the most serious postoperative complication (28.5%). It is also at par with other studies. A part from all patient related factors even a small breach in the maintenance of asepsis can play a significant role. Statistically noting that the lesser grievous URTI is always high in frequency all over.

COMPARISION OF ODDS RATIO OF VARIOUS PPC WITH MODIFIABLE FACTORS

STUDY	OLD AGE (>60 YEARS)	OBESITY	SMOKING	PREVIOUS RESPIRATORY DISEASES
AROZULLAH ET AL	-	4.1	5.7	4.2
MCALISTER ET AL	4.7	3.8		3.3
SHANDER ET AL	1.4	-	-	-

SMETNA AT AL	2.7	-	-	-
NERTILA KODRA ET AL	11.41	-	-	11.12
PRESENT STUDY	3.2	3	1.4	2.5

The physiological aging of the respiratory system leads to a decrease in the elasticity of the parenchyma and pulmonary complacency, in the strength of the muscles involved in the respiration, and a decrease in the alveolar surface and cilia of the respiratory tract. These changes may lead to poor coughing and increased respiratory work, with increased dependence on the diaphragm.

One of the main alterations implicated in the smoking is the damage to the cilia of the tracheobronchial mucosa and increased mucus production with high consistency, in addition to an increased susceptibility to alveolar collapse, leading to higher chance of infection in the lower airways.

While previous history of respiratory diseases has direct association with the increase in chance of getting respiratory infection as alteration in respiratory mucosa.

COMPARISON OF INCIDENCE OF PPC WITH DURATION OF OPERATION IN ODD RATIO

STUDY	DURATION OF OPERATION (>3HRS)
NERTILA KODRA ET AL	8.38
PATEL ET AL	1.01
SHANDER ET AL	9.7
PRESENT STUDY	15.5

We have found prolonged surgery, ranging from 3 to 4 hours, to be an independent predictor of postoperative pulmonary complication. They are directly proportional to each other.

COMPARISION OF DURATION OF HOSPITAL STAY WITH OTHER STUDIES

STUDY	DURATION OF HOSPITAL STAY IN PPC(IN DAYS)
FINLAY ET AL	27.9
PATEL ET AL	10
AROZULLAH ET AL	>5
PRESENT STUDY	15.8

Above various studies observational data of mean duration of hospital stay suggest that mean duration of stay increases once patient develops post operative pulmonary complication. This occurs with reasonably equal frequency worldwide.

COMPARISON OF INCIDENCE OF MORTALITY DUE TO POST PULMONARY COMPLICATIONS

STUDY	MORTALITY DUE TO PPC
PATEL ET AL	12.5%
ZEWDITTU ABDISSA ET AL	11.4%
PRESENT STUDY	8.57

Our study showed a mortality due to post op respiratory complication was 8.57%. while post operative pulmonary complications were associated with substantial mortality.

- In our prospective study of 100 patients operated under general anaesthesia at GURU GOVIND SINH HOSPITAL, JAMNAGAR IN A PERIOD OF TWO YEARS FROM NOVEMBER 2017 TO OCTOBER 2019. We could demonstrate the importance of patient related, surgery related and anaesthesia related risk factors in development of PPC.
- Post operative pulmonary complications are common complication after cardiac complication and wound infection.
- It affects the 6^{th} decade of life more commonly.
- Males are more commonly affected.
- The presentation of ppc is almost equal in form of URTI and LRTI.
- Klebsiella is the most common microbial pathogen found.
- Most of the patients encountered with PPC developed fever, cough, tachycardia, expectoration and hypoxemia.
- The PPCs after the surgery were ranging from sore throat in the post operative period which can be treated with the conservative management to severe complications such as pneumonia and atelectasis which may prove fatal.

- If the risk factors are identified preoperatively, proper anaesthetic planning can reduce the incidence of complications.
- Limiting the duration of surgery to <3 hours, using a minimally invasive surgeryand using regional techniques can decrease the incidence of complications.
- Use of tapered cuff polyurethane tubes is advocated.
- Proper lubrication of the cuff and aspiration of subglottic secretions decrease the chances of aspiration.
- Incidence of ICU shift was more in the patients who are operated for >3 hours than compared to those operated for < 3 hours.
- Sputum positivity for the organism is directly proportional to the development of PPC.
- In our study all patients who developed PPC were treated with IV antibiotics and patients with URTI and those with LRTI required oxygen support and physiotherapy in addition to IV antibiotics. One patient with broncoscopy for mucus plug removal.
- There is increased number of length of hospital stay found in who developed PPC as compared to those without PPC.
- Our study shows 3 patients were dead due to PPC and rest discharged.

V. Conclusion

The complete preoperative workup, smooth per operative journey and and an uneventful postoperative outcome is always desired by both patients and clinicians. When we consider general anesthesia, the condition is more complex. This affects all bodily systems and hence final outcome of the patients.

In general anaesthesia the large respiratory surface area is in continuous contact with the endotracheal tube, air from the ventilator circuit and the anaesthetic drugs. This increases the chances of PPC development.

In our study the PPCs after the surgery ranging from hypoxemia in the post operative period which can be treated with simple oxygen therapy to severe complication duch as ALI which may prove fatal. If the risk factors are identified preoperatively, proper anaesthetic planning can reduce the incidence of the complications. Limiting the duration of surgery to < 3 hours, using a minimally invasive surgery and regional techniques can decrease the incidence of complications.

Clinicians should employ strategies to reduce postoperative pulmonary complications in the patients who are at high risk after clinical risk stratification. Good evidence shows that patient related risk factors, such as chronic obstructive pulmonary disease, age older than 60 years, ASA class of III or higher, functional dependence, obesity increase the risk for postoperative pulmonary complications. In addition, patients undergoing such procedures as prolonged abdominal surgeries, thoracic surgery, neurosurgery, head and neck surgery, vascular surgery, aortic aneurysm repair and emergency surgery are at higher risk for postoperative pulmonary complications. General anaesthesia is also a stronger marker of increased risk. Good evidence exists to support risk reduction stragies, including incentive spirometry and deep breathing exercises.

Each and every case of PPC do not require oxygen support but it actually increases post operative hospital stay with increase chances of morbidity,and at time fatal.

A genuine, sincere and serious multidisiciplinary approach is essential for the prevention of PPC development and successful outcome for the patient.

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