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# Co-relation of comorbid conditions such as Diabetes, Hypertension, Thyroid related problems, Cardiac problems, Cardio-Pulmonary and their association with health care associated infections

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**Abstract:** *Background:* To determine the co- relation between the number of comorbid conditions which are related to most commonly associated health care associated infections such as urinary tract infections (UTI), blood stream infections (BSI), ventilator associated infections (VAP), surgical site infections (SSI). *Methods:* Using secondary data, all the patients who had HAI for 3 years were taken into consideration. *Results:* Retrospective data collected for the period of 3 years from January 2013 to December 2015 for the inpatients who got admitted for more than 48 hours of duration, the data collected included the parameters for number of co- morbid conditions each patient presented with the diseases / illness of health care associated infections like urinary tract infections, blood stream infection, ventilator associated pneumonia and surgical site infection. The data collected showed that many patients had 1 st co-morbid condition in 40% of the population. *Conclusions:* Most of the patients who had an HAI , co-related to have one type of co- morbid condition which was common among all the patients , then there a tapering of co-morbid conditions , many patients had 2 nd co- morbid condition of (20%) **,** 3 rd co- morbid condition of (15%) , 4 th co- morbid condition of (5 %) and 5 th co- morbid condition of (3%) . Hence there is a need to control and to monitor the co- morbid condition before planning any intervention procedures / invasive procedures which may lead to HAI.

**Keywords:** Co- morbid conditions, Health care associated infections, Co-relation

## Introduction

Comorbidity is the presence of one or more additional conditions co-occurring with a primary condition [1]. Co-morbid is a medical condition existing simultaneously but independently with another condition in a patient and it is also used to indicate a medical condition in a patient that causes, is caused by, or is otherwise related to another condition in the same patient [2]. Co-morbid indicates two or more medical conditions existing simultaneously regardless of their causal relationship [3].

Comorbid conditions are associated with increased risk for HAI [4 -7]. More limited research has been done to assess whether patients with certain comorbid conditions may be at greater risk for health care associated infections than other patients [8-9]. Health care increasingly needs to address the management of individuals with multiple coexisting diseases [10]. In the United States, about 80% of Medicare spending is devoted to patients with 4 or more chronic conditions, with costs increasing exponentially as the number of chronic conditions increases [11]. Co-morbidities are associated always associated with complications and with the burden of severity of diseases [12]. Purpose of the present study is to conceptualize coexistence of 1 or more conditions.

## Material and Methods

Study was conducted in M.S. Ramaiah hospital, a tertiary care teaching hospital with 12 –general specialty and 13 – super specialty

departments with 800 bed strength. The hospital offers clinical services like out patient services, in-patient services, multidisciplinary intensive care, paediatric ICU, neonatal ICU services, accident and emergency services -24/7, 13 major operation theatres. Non clinical/supportive services includes NABL accredited laboratory radiology, maintenance department, biomedical engineering department, medical records department, laundry, CSSD dietary services, rehab and physical medicine, mortuary.

This study is based on the retrospective data for HAI surveillance data subjected to ICD-10 Coding. The study focused on the data collected from January 2013 – December 2015 from all the inpatients who were admitted for more than 48 hours and categorized as per ICD – 10 coding. Inclusion criterion included patients confirmed with urinary tract infections (UTI), blood stream infections (BSI), ventilator associated pneumonia (VAP) and surgical site infections (SSI). Data collected included that the patients who had co-morbid conditions. Most common type of co-morbid conditions were taken into consideration and categorized in to number of co- morbid conditions each patient had with HAI. Data was collected for 3 years, Based on the International Classification of Diseases - 10 (ICD-10) , nature of the co- morbid conditions presented with diseases / illnesses / health problems were taken into consideration by retrospective collected data. Diabetes, Hypertension, and Thyroid related problems, Cardiac problems, Cardio- Pulmonary.

*Statistical analysis:* Retrospective data was collected using descriptive analysis, calculated based on ICD- 10 Coding for the most commonly occurring health care associated infections as mentioned above. Data was collected entered into the Microsoft Excel Spread Sheet. The data was subjected to various data quantity checks and the data was exported to SPSS Software version 16.0 Quantitative analysis for continuous variables was done and summarized by using excel spread sheet presented in the form of tables, frequency of mean was calculated and the diagrams were plotted on continuous graph for the representation of the results. The percentage of each health care associated infections were done. Data was collected as per the final diagnosis and ICD-10 coding.

## Results

Study period included records of 3 years, total in-patient admissions was 79401.most common types of HAIs like UTI , BSI , VAP and SSI were taken into consideration and the number of co- morbid conditions were taken into condition .

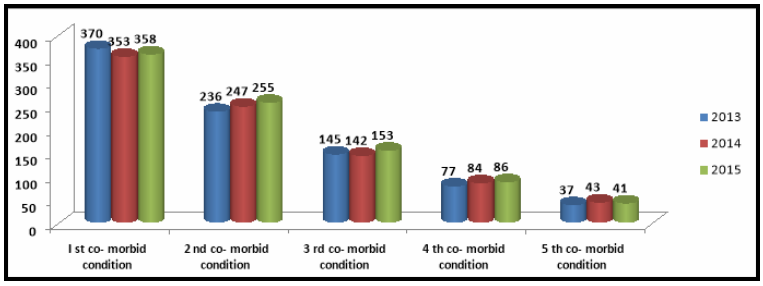
### 1. Co-Morbidity status in Urinary Tract Infection

Among the UTI confirmed cases, Co-morbidity conditions such as Diabetes, Hypertension, Thyroid related problems, Cardiac problems and Cardio- Pulmonary were taken into consideration. Year 2013 – had 90 (20.5%) patients with co-morbid conditions, 2014 -75 (16.6%), 2015 – (37.2%) patients.

Patients who had Urinary Tract Infection had diagnosed to have one or more diseases. Frist co- morbid condition was present in almost all the cases , 2 nd co- morbid condition (20.3%), 3 rd co- morbid condition (16.3%), 4 th co- morbid condition (8%), 5 th co- morbid condition (3.8%) contributing respectively. Number of Co- morbid conditions have been explained in the Figure – 1.

Distribution of Co-Morbid conditions in Month wise and percentage has been explained in the Table-1.

**Fig-1:** Morbidity profile of UTI



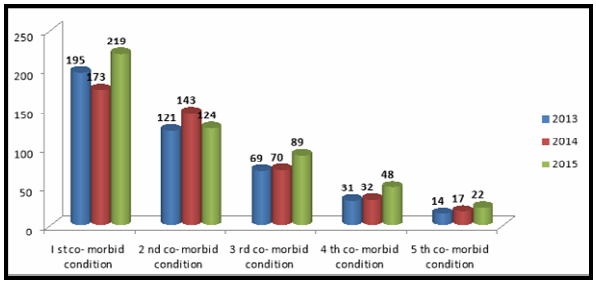
| Table-1: Distribution of Co-Morbid conditions in UTI - Month wise | | | |
|---|---|---|---|
| **Month** | **2013 n(%)** | **2014 n(%)** | **2015 n(%)** |
| Jan | 8(20.5) | 10(25.6) | 21(45.7) |
| Feb | 6(15.8) | 4(19) | 19(46.3) |
| Mar | 9(21.4) | 5(15.2) | 23(63.9) |
| Apr | 9(32.1) | 3(8.3) | 14(40) |
| May | 10(27.8) | 7(26.9) | 8(26.7) |
| Jun | 8(21.6) | 7(17.9) | 15(29.4) |
| Jul | 7(17.5) | 5(9.8) | 7(20.6) |
| Aug | 7(21.2) | 11(31.4) | 8(29.6) |
| Sep | 7(20.6) | 9(25.7) | 9(28.1) |
| Oct | 8(20) | 6(21.4) | 14(32.6) |
| Nov | 7(20) | 3(7.7) | 14(40) |
| Dec | 4(10.8) | 5(7.4) | 8(42.1) |

## 2. Co-Morbidity Status in BSI

Among the BSI confirmed cases , Co-morbidity conditions such as Diabetes, Hypertension, Thyroid related problems , Cardiac problems were taken into consideration .Year 2013 – had 52 (50.8%) patients with co-morbid conditions , 2014 -110 (91.6%), 2015 – 59 (46.8%) patients .

*Morbidity profile of BSI:* Patients who had blood stream infections had diagnosed to have one or more diseases. First co- morbid condition was present in almost all the cases , 2 nd co- morbid condition (20.3%), 3 rd co- morbid condition (16.3%), 4 th co- morbid condition (8%), 5 th co-morbid condition (3.8%) contributing respectively. Number of Co- morbid conditions have been explained in the Figure- 2.

**Fig-2:** Morbidity profile of BSI




Distribution of Co-Morbid conditions in Month wise and percentage has been explained in the Table-2.

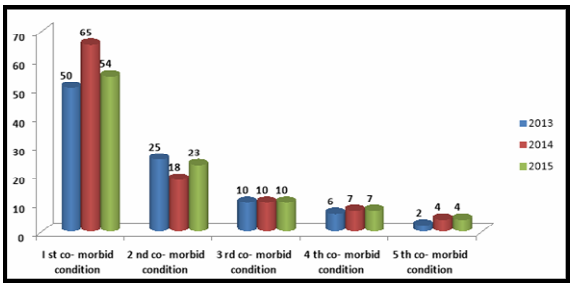
| Table-2: Distribution of Co-Morbidity status -BSI | | | |
|---|---|---|---|
| **Month** | **2013(n%)** | **2014(n%)** | **2015(n%)** |
| Jan | 4(40) | 8(80) | 4(30.8) |
| Feb | 3(25) | 4(80) | 8(47.1) |
| Mar | 3(21.4) | 4(80) | 4(44.4) |
| Apr | 4(100) | 13(76.5) | 5(71.4) |
| May | 4(100) | 12(80) | 2(40) |
| Jun | 5(45.5) | 9(100) | 6(66.7) |
| Jul | 3(33.3) | 8(72.7) | 10(58.8) |
| Aug | 4(50) | 8(100) | 3(33.3) |
| Sep | 7(41.2) | 8(88.9) | 4(44.4) |
| Oct | 9(64.3) | 7(87.5) | 6(42.9) |
| Nov | 4(44.4) | 11(73.3) | 4(30.8) |
| Dec | 2(100) | 7(87.5) | 3(75) |

## 3. Co-Morbidity status in VAP

Among the BSI confirmed cases, Co-morbidity conditions such as Diabetes, Hypertension, and Thyroid related problems, Cardiac problems were taken into Consideration. 10 cases had co-morbid conditions contributing to (23.2 %) in the year 2013, 10 (18.1%) in the year 2014 and 9 (18%) in the year 2015

*Morbidity profile of VAP:* Patients who had Ventilator associated pneumonia had diagnosed to have one or more diseases. Frist co- morbid condition was present in almost all the cases , 2 nd co- morbid condition (22.5%), 3 rd co- morbid condition (10.2%), 4 th co- morbid condition (6.7%), 5 th co-morbid condition (3.3%) contributing respectively. Number of Co-morbid conditions have been explained in the Fig-3.

**Fig-3:** Morbidity profile of VAP



Distribution of Co-Morbid conditions in Month wise and percentage has been explained in the Table- 3.

**Table-3: Month Distribution of Co-Morbidity status in VAP**

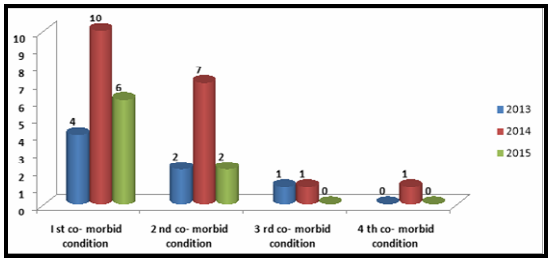
| Month | 2013 | 2014 | 2015 |
|---|---|---|---|
| Jan | 4(100) | 1(16.7) | 1(12.5) |
| Feb | 2(40) | 0(0.0) | 1(16.7) |
| Mar | 3(30) | 0(0.0) | 2(25) |
| Apr | 0(0.0) | 1(33.3) | 0(0.0) |
| May | 0(0.0) | 2(66.7) | 1(33.3) |
| Jun | 0 | 1(33.3) | 2(28.6) |
| Jul | 0 | 0.0 | 0 |
| Aug | 0 | 2(50) | 0 |
| Sep | 0 | 2(22.2) | 1(33.3) |
| Oct | 0 | 0 | 0.0 |
| Nov | 1(20) | 0 | 1(33.3) |
| Dec | 0 | 1(100) | 0 |

## 4. Co-Morbidity Status in SSI

Among the SSI confirmed cases, Co-morbidity conditions such as Diabetes, Hypertension, and Thyroid related problems, Cardiac problems were taken into consideration. 20 cases had co-morbid conditions, (40%) in the year 2013, (40 %) in the year 2014 and (20%) in the year 2015, and the co-morbid status was equal in the year 2013 and 2014 and slightly lower in the 2015.

*Morbidity profile of SSI:* Patients who had Ventilator associated pneumonia had diagnosed to have one or more diseases. Frist co- morbid condition was present in almost all the cases , 2 nd co- morbid condition (32.7%), 3 rd co-morbid condition and 4 th co- morbid condition were present very minimally .respectively. Number of Co- morbid conditions have been explained in the Figure – 4.


**Fig-4:** Morbidity profile of SSI




Distribution of Co-Morbid conditions in Month wise and percentage has been explained in the Table-4.

**Table-4: Month Distribution of Co-Morbidity status in SSI**

| Month | 2013 | 2014 | 2015 |
|---|---|---|---|
| Jan | 0.0 | 0.0 | 0.0 |
| Feb | 0.0 | 1(25) | 0.0 |
| Mar | 0.0 | 0(0.0) | 0.0 |
| Apr | 0.0 | 0(0.00 | 1(100) |
| May | 0.0 | 1(100) | 1(50) |
| Jun | 0.0 | 1(100) | 0.0 |
| Jul | 1(100) | 0.0 | 1(50) |
| Aug | 0.0 | 1(50) | 0.0 |
| Sep | 1(100) | 1(100) | 1(100) |
| Oct | 2(100) | 1(100) | 0.0 |
| Nov | 3(100) | 0.0 | 0.0 |
| Dec | 1(100) | 2(100) | 0.0 |

## Discussion

Co-morbid conditions always co- relate to health care associated infections co- morbid conditions were taken for most commonly occurring HAIs like Urinary tract infections [UTI], blood stream infections [BSI], ventilator associated pneumonia [VAP], surgical site fections [SSI] were taken for the study purpose.

A study conducted by Frykberg [13-14] reported that the co- morbid conditions such as Diabetes increase the risk of skin and soft tissue infections requiring hospitalizations, which quite common in my study. Study reported by McAlister [15] Concluded that there is a strong co – relation between the

healthcare-associated pneumonia and the co-morbid conditions which was noticed in my study also.

Study conducted by Ata [16] reported that there is an elevated risk of SSI with post-operative glucose levels of 110 mg/ld, and higher levels of post-operative glucose in those with SSI for the patients who had co-morbid conditions and the positive association we observed in a study conducted by a author and reflected that uncontrolled glucose levels increase the risk of HAIs.

Study conducted by Delamaire [17] reported that hyperglycemia could affect vulnerability to infection through compromising the immune system, by way of decreasing chemotaxis of neutrophils decreasing the ratio of T helper type 1 immune profile to type 2 diabetes. Study conducted by Viardot [18] reported that co-morbid conditions increases the risk of microorganisms, especially in the respiratory airway. Study conducted by Baker [19] reported that the possibility that hyperglycemia may be a causal risk factor of HAIs, which was common in my study also

## Conclusion

Co- morbid conditions always increases the risk of Health care associated infections. The rate of increase in HAI depends on the number of co- morbid conditions each patient during the time of hospitalization. Many had 1 st co- morbid condition which aggravated HAI, when the procedure was done. Study concludes that the strong co- relation between HAI and the number of co- morbid conditions.

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