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### RESEARCH ARTICLE

## UTILIZING HOSPITAL ELECTRONIC DATA TO IDENTIFY CAUSES OF HOSPITALIZATION IN A TERTIARY HOSPITAL, TAIF, SAUDI ARABIA (2005\_2014)

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### Abstract

**Objectives:** This study aimed to explore the benefits of utilizing existing hospital discharged data to identify causes of hospitalization from 2005– 2014 in an attempt to illustrate the benefits of such data and lay the basis for the regular use of these data in the future.

**Methods:** A retrospective hospital-based study conducted at a tertiary hospital, Taif, Saudi Arabia. All discharges and day surgeries from 2005 to 2014 were included in the study. Data was obtained from the hospital's electronic system.

**Results:** The total number of discharges was 240,241. The mean patient age was 32 years. The main causes of hospitalization were Injuries, including those from transport accidents, with 17,572(15.3%) cases, followed by diabetes mellitus and hypertensive heart disease with 5463 (4.7%) and 4631 (4%) respectively. Injuries remained the number one cause of hospitalization over the 10 years.

**Conclusion:** Existing hospital electronic data can provide valuable information that can be used for health care planning and research. Injuries, non-communicable diseases, and neonatal conditions were among the most common causes of hospitalization.

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### Introduction:-

The value of using hospital discharged data has been illustrated early as a valuable resources for health researches.<sup>1</sup>The significance of discharge data pertains to not only health research, but also health planning and public health issues. In order to make effective use of hospital data, consideration should be given to the quality and accuracy of existing data as well as improved data connectivity<sup>2</sup>

Information and statistics on the most frequent reasons for hospitalization can be used for research, and in the prioritization and promotion of training programs for health workers at the institutional, local and national levels.<sup>3</sup>

In developed countries, hospital data have been collected and reported regularly with guidelines for the sustainability and quality control of coded data.<sup>4</sup>

In the USA, statewide hospital discharge databases have become an important component of the data infrastructure for health services research as well as local, state, and hospital needs. Almost all states have data organizations collecting administrative data in addition to information on inpatient stays and usage of emergency department, ambulatory surgery, and other hospital outpatient services which have been widely used by health researchers.<sup>5</sup>

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In Australia, the National Hospital Morbidity Database (NHMD) has data on demographics, administration, and length of stay for admitted patients, as well as data on the diagnoses of the patients, the procedures they underwent in hospital, and external causes of injury and poisoning.<sup>6</sup>

In Europe, many countries, in collaboration with the World Health Organization, are collecting data on health-care activities, including the number of total discharges.<sup>7</sup>

In Saudi Arabia, although many hospitals have obtained international accreditation and have advanced health information system infrastructure, hospital data has not been optimally utilized.<sup>8</sup>

Moreover, there are discrepancies in the health information system when considering various health service providers, with little connection between these sectors. As a result, patient information, including discharge data, is scattered.<sup>9</sup>

Causes of hospital admission differ between high- and low-income countries. In Africa, a systematic review that included 30 articles from Sub-Saharan Africa between 1950 and 2010 found that the leading causes of admission were infectious and parasitic diseases followed by respiratory and circulatory illnesses.<sup>10</sup>

A study conducted in Ethiopia in 2008 found that communicable diseases; namely severe community-acquired pneumonia and all infectious and parasitic diseases, as well as chronic meningitis, were the most common causes of hospitalization.<sup>11</sup>

In Saudi Arabia, a study conducted in Jeddah in western Saudi Arabia near Taif found that non-communicable diseases (NCDs, diabetes mellitus (DM), ischemic heart disease (IHD), Hypertension, and chronic renal failure) were the leading reasons for hospitalization.<sup>12</sup>

Another study conducted in the Assir region in Saudi Arabia, found that cardiovascular diseases, DM, and hypertension were the main causes for hospitalization.<sup>13</sup>

Given the importance of hospital discharge data and its limited use in Saudi Arabian hospitals, this study aimed to utilize existing electronic data on hospital discharges from 2005 to 2014 to identify the main reasons for hospitalization in an attempt to effectively utilize these data, demonstrate their benefits and build a basis for their regular use in the future to assist decision-makers and researchers.

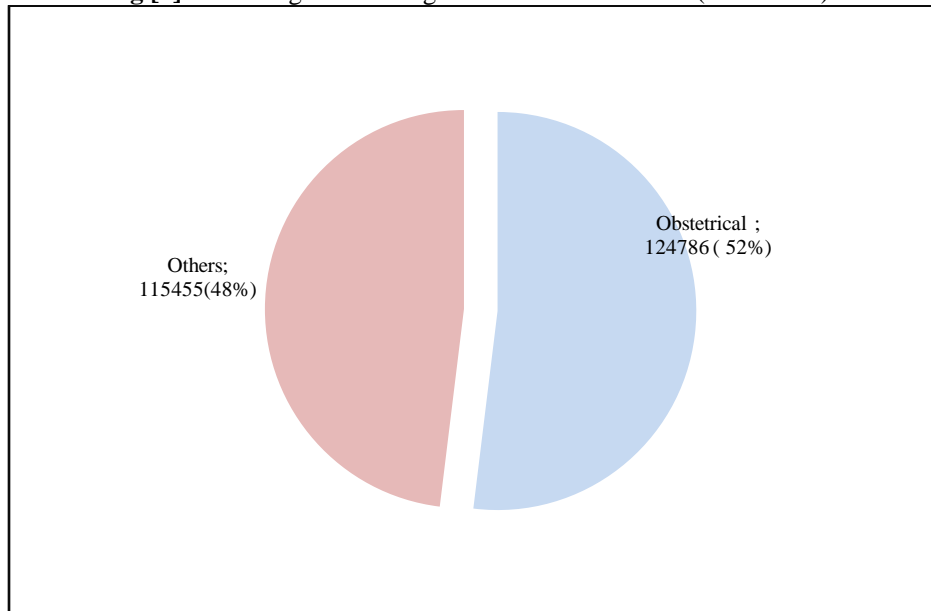
### **Materials and Methods:-**

This was a retrospective hospital-based study conducted in 2016 at the King Abdulaziz Specialist Hospital, Taif, Saudi Arabia. Retrospective data on all discharges and day surgeries from 2005 to 2014 were collected from the hospital information system. Clinical coders routinely extract data from medical records and enter them into the database system (care system) using the International Classification of Diseases Tenth Revision, Australian Modification (ICD-10 AM). Data (patient sex, nationality, age, and diagnosis) were extracted from one screen (patient diagnosis).

The data were transported from the hospital database to an Excel file and then to SPSS (version 20) for analysis. Analysis was done in two phases: (1) Analysis of all cases and (2) exclusion of obstetrical conditions as most were normal deliveries. Ethical approval was obtained from the local research ethics committee.

### **Results:-**

The total number of discharges was 240,241, of which obstetrical conditions constituted 125,137 (52%) cases and other admissions amounted to 115,104 (48%) cases (Figure 1).

**Fig [1]:-** Discharges according to obstetricalVs. others (2005-2014).

In the initial analysis of all cases, there were 64,076 (26.7%) males and 176,165 (73.3%) females. After obstetrical causes were excluded, there were 64,076 (55.5%) males and 51,379 (44.5%) females.

The mean patient age was 32 years for all and 35 years after exclude obstetrics. The most common age group was 25\_34 years for all cases and 65 years and older after obstetrical cases were excluded (Table1).

**Table 1:-** Characteristics of Hospital discharges patients 2005\_2014(obstetrics excluded).

Variables	Discharges (All cases)	Discharges (obstetrics excluded)
<b>Gender</b>		
Male	64076(26.7%)	64076(55.5%)
Female	176165(73.3%)	51379(44.5%)
<b>Nationality</b>		
Saudi	206428 (85.9%)	
Non Saudi	33813(14.1%)	
	N (%)	N (%)
<b>Age group</b>		
less than 1	16839 (7%)	16839 (14.6%)
1 - 4yrs	5836 (2.4%)	5836 (5.1%)
5 - 14 yrs.	8262 (3.4%)	8154 (7.1%)
15 - 24yrs	50345 (21%)	16178 (14.0%)
25 - 34yrs	80661 (33.6%)	15163(13.1%)
35 - 44 yrs.	34839 (14.5%)	10759 (9.3%)
45 - 54 yrs.	11334(4.7%)	10401 (9%)
55 - 64yrs	10394(4.3%)	10394 (9%)
65+	21731(9%)	21731(18.8%)

Regarding causes of hospital admission (excluding obstetrical conditions), injuries including those from transport accidents ranked number one with a total of 17,572(15.3%) discharges followed by DM (5,463 [4.7%]), hypertensive heartdisease (4631 [4%]), disorder of the Lens (mainly Cataract) (4532 (3.9%)), respiratory distress of newborn (4324[3.8%]), preterm infants (3120 [2.7%]), congenital abnormalities (3032 [2.6%]), IHD(3014[2.6%]), renal failure (2676 [2.3%]), and appendicitis (2428 [2.1%]). These top causes amounted to a total of 50,792(44.1%) cases(Table 2).

**Table 2:-** Top ten causes of Hospitalization 2005-2014 (obstetrics excluded).

ICD-10 AM Code	Primary reason for hospitalization	Frequency (%)
V01-V99 & S00-S99	Injuries including Transport accidents	17572 (15.3%)
From E10.0 To E15	DM	5463(4.7%)
I10-I15	Hypertensive heart disease	4631(4.02%)
From H25. To H28.0	Disorders of lens (mainly cataract)	4532(3.93%)
From P22. To P22.9	Respiratory distress of newborn	4324(3.8%)
From P07.2 To P07.32	Preterm infants	3120(2.71%)
Q00-Q99	Congenital abnormalities	3032(2.63%)
I20-I25	Ischemic Heart Disease	3014(2.61%)
N17 - N19	Renal failure	2676(2.32%)
K35 - k37	Appendicitis	2428(2.1%)
<b>Total of top 10</b>		<b>50792(44.1%)</b>
<b>Other diseases</b>		<b>64312(55.9%)</b>
<b>Total of all discharges</b>		<b>115104(100%)</b>

The most common causes of hospitalization among both males and females were similar except that injury cases were much higher among males (Table 3).

**Table 3:-** Top ten causes of Hospitalization (by gender), Taif Saudi Arabia 2005\_2014(obstetrics excluded).

Males				Females			
Rank	ICD-10 AM Code	Primary reason for hospitalization	NO (%)	Rank	ICD-10 AM Code	Primary reason for hospitalization	NO (%)
1	V01-V99 & S00-S99	Injuries	14043(21.92%)	1	V01-V99 & S00-S99	Injuries	3529(6.9%)
2	E10.0 - E15	DM	2818(4.4)	2	E10.0 - E15.	DM	2645(5.1%)
3	P22. - P22.9	RD of newborn*	2536(3.96)	3	I10-I15	HT	2271(4.4 %)
4	I10-I15	HT	2360(3.68)	4	H25.-H28.0	Disorders of lens **	2179(4.3%)
5	H25. - H28.0	Disorders of lens**	2353(3.67%)	5	P22. - P22.9	RD of newborn*	1788(3.5%)
6	I20-I25	IHD	2027(3.16%)	6	P07.2 - P07.32	Preterm infants	1404(2.8 %)
7	Q00-Q99	Congenital Malformation	1769(2.76%)	7	Q00-Q99	Congenital Malformation	1263(2.5%)
8	P07.2 - P07.32	Preterm infants	1716(2.68%)	8	P05.0-P07.13	LBW	1202(2.4%)
9	N17 - N19	Renal failure	1512(2.36%)	9	N17 - N19	Renal failure	1164(2.3%)
10	K35 - k37	Appendicitis	1382(2.16%)	10	K35 - k37	Appendicitis	1046(2%)
<b>Total of top 10</b>			<b>32516(50.7%)</b>	<b>Total of top 10</b>			<b>18491(36.2%)</b>
<b>Other diseases</b>			<b>31560(49.3%)</b>	<b>Other diseases</b>			<b>32537(63.8%)</b>
<b>Total of all males</b>			<b>64076(100%)</b>	<b>Total of all females</b>			<b>51028(100%)</b>

\*RD: Respiratory Distress of newborn

\*\* Disorders of lens (mainly cataract)

With respect to the ranking of cases, injuries remained the leading cause of hospitalization throughout the entire period 2005\_2014. In addition, DM, IHD, and renal failure were among the top causes of hospitalization (Table 4).

**Table 4:-** The ranking by reason of hospitalization in years, Taif Saudi Arabia 2005\_2014.

Disease	Ranking / Years									
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Injury	1	1	1	1	1	1	1	1	1	1
Diabetes Mellitus	6	3	3	4	6	4	2	2	2	3
Hypertension	10	9	5	12	9	4	5	3	3	2
IHD	11	10	10	13	12	6	8	6	5	5
Renal failure	4	7	8	11	10	9	9	9	9	10

### Discussion:-

Effectively utilizing existing hospital data is an optimal use of resources, as hospitals have a wide range of data (electronic and manual) that can be used for health planning and decision-making.

Moreover, the analysis of hospital inpatient data provides evidence regarding morbidity patterns of hospitalized patients that can be used for research purposes.

This study utilized existing discharge data from 2005 to 2014 and showed that, injuries were the most common cause of hospitalization throughout all 10 years. This may be due to the increasing demand for cars and industrialization and the growing economy of Saudi Arabia.

NCDs (DM, hypertension, IHD, and renal failure) were among the top ten causes of hospitalization. This is consistent with a study conducted in other regions in Saudi Arabia, that also found these to be among the top causes of admission<sup>12</sup>. Similarly, a study conducted in Assir Region, Saudi Arabia found cardiovascular diseases, DM, and hypertension to be the leading causes of hospitalization.<sup>13</sup> In contrast to the results of this study, a systematic review of 30 articles from Sub-Saharan Africa between 1950 and 2010 found the leading causes of admission to be infectious and parasitic diseases followed by respiratory and circulatory illnesses.<sup>10</sup>

The rise in NCDs in Saudi Arabia may be due to the spread of western lifestyle patterns. The results imply that NCDs would be better managed in primary health-care institutions. Currently, patients are referred to a hospital if complications occur. These results mean that many patients have complications, thus increasing the demand for hospitals and increasing the cost of treatment. Many complications of NCDs can be prevented if they are properly treated in primary health care institutions.

Neonatal conditions (preterm birth, respiratory distress, and congenital anomalies) were among the top ten causes of hospitalization in this study which may be because King Abdulaziz Specialist Hospital is the only public hospital with an obstetric department in Taif city, and thus it receives all complicated cases referred from nearby hospitals in the Taif region.

Moreover, eye disorders were reported as a leading cause of hospitalization because day surgery data (most of which involves eye disorders) were included in the database of hospital discharge data.

The hospitalization patterns did not differ between males and females, except that injuries among males were much higher because males are more exposed to injuries during this period especially road traffic accidents, as women were not allowed to drive cars until 2014.

Concerning quality control and data validity, we took a random sample to confirm the diagnoses and found that diagnoses of known and familiar diseases were written and coded correctly.

### Conclusion:-

Hospital discharge data can provide evidence regarding morbidity patterns for policymakers and researchers for service improvement, budget allocation, and prevention programs.

The most prominent causes of admissions found in this study were injuries, NCDs, and neonatal conditions. Efforts should be directed towards preventive measures for NCDs and good antenatal care to prevent neonatal complications.

Using hospital electronic data with one screen provided valuable results (causes of hospital admission) in this study. Adding more variables by connecting other screens to obtain additional information (such as length of stay, and insurance) could become the nucleus of a national program to collect and compile data from all hospitals and obtain national reports. Accuracy and quality of data should be considered during data collection and entry.

**Declarations:**

The author declares that this work is original and this manuscript has not been published in any other journals.

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