International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

Regional Competitiveness of Healthcare Services in Saudi Arabia

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Abstract: ***Healthcare services are one of the most important services for any country. The welfare of the citizens largely depends upon the availability of competent and affordable healthcare services in the region. The Saudi Government has attached considerable importance to enhancing the healthcare sector in the Vision 2030. This study aims to develop a model for measuring competitiveness of healthcare services in the different regions of Saudi Arabia, which may be useful to the health ministry in monitoring the progress of healthcare services in the region. The proposed model was used to examine the current competitiveness of the 13 administrativeregions of Saudi Arabia and to identify the scope for improvement of healthcare parameters. The regional healthcare competitiveness was measured across 18 dimensions on a scale of 0 to 10. It was observed that the overall healthcare competitiveness index of Riyadh region was the highest while that of Asir region was the lowest. The proposed model allows scope for further refinement and enhancements.***

Keywords: Competitiveness, Healthcare, Administrative regions

1. Introduction

Healthcare services are one of the most important services in a country that contribute to the welfare of the citizens. Availability of competent and affordable healthcare services in the region is critical for the wellbeing of people belonging to that region. The Saudi Government has attached considerable importance to enhancing the healthcare sector in the Vision 2030[(1)]. Healthcare services in the Kingdom of Saudi Arabia (KSA) are provided by hospitals and clinics run by the Ministry of Health (MoH), other public institutions and private institutions as well. The 20 directorates of the Ministry of Health in Saudi Arabia are spread across 13 administrative regions[(2,3)].Healthcare services are available in each region in terms of hospitals, health centers, specialized clinics, laboratories and diagnostic services, pharmacies, and rehabilitation centers. The MoH directorates and the administrative regions are listed in Table 1 below.

Table 1: Administrative Regions and Ministry of Health Directorates of KSA

Sr.	*Administrative Region*	*MoH Directorates*
1	Riyadh	Riyadh
2	Makkah	Makkah, Jeddah, Taif, Qunfudah
3	Madinah	Madinah
4	Qassim	Qassim
5	Eastern Region	Eastern Region, Al Ahsa, Hafer Al Baten
6	Asir	Asir, Bisha
7	Tabuk	Tabuk
8	Hail	Hail
9	Northern Border	Northern Border
10	Jazan	Jazan
11	Najran	Najran
12	Al Baha	Al Baha
13	Al Jouf	Al Jouf, Qurrayat

The healthcare services available in these regions are governed by the MoH. The quality, outreach and effectiveness of the services, which is termed as "competitiveness", depends upon various factors such as availability of infrastructure and human resources, accreditation status of hospitals, vicinity of healthcare facilities to the regional population, availability of educational institutions etc. The existing literature does not cover the concept of competitiveness for healthcare sector, which has prompted the researcher to conduct this study for the regions of KSA.

2. Literature Review

The concept of State competitiveness has been well established in the modern economies of the world. The Global Competitiveness Report published annually by the World Economic Forum defines "competitiveness as the set of institutions,policies, and factors that determine the level ofproductivity of an economy, which in turn sets the levelof prosperity that the country can achieve".The competitiveness is measured across 12 pillars (or parameters) such as Institution, Infrastructure, Macroeconomic Environment, Labor Market Efficiency, Technological Readiness etc.[(4)] This concept is being now applied to measure the competitiveness of regions and of the countries as well, as seen from the The Middle East Competitiveness Report published in 2016 [(5)]. The authors proposed four dimensions of regional competitiveness, namely, outcomes, outputs, knowledge capital and knowledge sustainability. Subsequently the concept of competitiveness was extended to individual sectors like healthcare sector. A study conducted in Thai healthcare sector in 2009 examined the competitiveness in terms of cost efficiency and profitability of healthcare sector in a global scenario [(6)].

Competitiveness in public healthcare institutions was discussed in a study conducted in the University of Kazakstan in 2014 [(7)]. The author developed a competitiveness index based on six groups of dimensions namely infrastructure and resource capacity, availability of staff, innovation and research provision, financial and economic support, marketing and external relations, and cost of medical services. Another study focused on the strategic importance of developing integrated performance measurement system of healthcare institutions for direct and

indirect patient care and administrative processes [8]. A study in Portugal published in the year 2010 discussed the conceptual framework for competitiveness of hospitals[9]. The performance parameters were suggested to be efficiency which is delivering high quality services at low costs and effectiveness which is the capacity to deliver clinical services with technical efficacy. However, no specific metrics were suggested in measurement of these parameters.

Zineldin et al published a study on integrated quality approach for measuring, evaluating and improving hospital quality parameters/dimensions [10]. They found that infrastructure, atmosphere and interaction are the three parameters that were rated important by the patients. However, this article was focused more on the individual hospital rather than the regional competitiveness. A study published by James Lee and Robert Clark addressed the impact of organizational restructuring on hospital competitiveness [11]. It was proposed that by considerable time is spent in transaction processing, logistics, documentation etc. at the cost of actual patient care. By appropriate restructuring of the hospital organization, its competitiveness could be improved.

As seen from the above discussion, there is no specific literature available on assessment of regional healthcare competitiveness. In the light of this, the current study assumes significant importance in providinga unique perspective to the policy makers in the healthcare sector. A comprehensive and quantitative competitive index for the region would be useful for the following purpose:

1) Identifying the weak areas (or dimensions of competitiveness)
2) Setting baselines for improvement
3) Resource planning
4) Financial budgeting
5) Monitoring of progress of the region

3. Methodology

The main objective of the study was to develop a healthcare competitiveness index for each administrative region of Saudi Arabia. This involved identification of appropriate dimensions for measuring competitiveness of healthcare institutions working in the regions. Based on the available literature and the healthcare data published by the MoH, total 18 dimensions of competitiveness were identified. They may be broadly categorized into a) Infrastructure capacity, b) Human resource availability, c) Quality of healthcare services, d) Usage of healthcare facilities, and e) Educational facilities and their usage.The competitiveness metrics are defined in the table 2 below.

Table 2: Competitiveness metrics

Sr.	Dimension of competitiveness	Metric	Remarks
1	Hospitals per 10000 persons	Number of hospitals x 10000/ Total population in the region	Measure of infrastructure capacity
2	Hospital beds per 10000 persons	Number of hospital beds x 10000/ Total population in the region	Measure of infrastructure capacity
3	Health centers per 10000 persons	Number of health centers x 10000/ Total population in the region	Measure of infrastructure capacity
4	Pharmacies per 10000 persons	Number of pharmacies x 10000/ Total population in the region	Measure of infrastructure capacity
5	Physicians per 10000 persons	Number of physicians x 10000/ Total population in the region	Measure of human resource availability
6	Nurses per 10000 persons	Number of nurses x 10000/ Total population in the region	Measure of human resource availability
7	Pharmacists per 10000 persons	Number of pharmacists x 10000/ Total population in the region	Measure of human resource availability
8	Allied healthcare personnel per 10000 persons	Number of allied healthcare personnel x 10000/ Total population in the region	Measure of human resource availability
9	% CBAHI accredited hospitals	Number of CBAHI hospitals x 100/ total number of hospitals in the region	Measure of quality of healthcare services
10	Outpatients per hospital	Number of outpatients visiting the hospital in the year/ total number of hospitals in the region	Measure of usage of healthcare facilities
11	Inpatients per hospital	Number of inpatients visiting the hospital in the year/ total number of hospitals in the region	Measure of usage of healthcare facilities
12	Emergency visits per hospital	Number of emergency visits handled by the hospital in the year/ total number of hospitals in the region	Measure of usage of healthcare facilities
13	Lab tests per hospital	Number of laboratory tests done by the hospital in the year/ total number of hospitals in the region	Measure of usage of healthcare facilities
14	Patients investigated per hospital	Number of patients for whom the laboratory tests done by the hospital in the year/ total number of hospitals in the region	Measure of usage of healthcare facilities
15	Bed occupancy rate	Average percentage of beds occupied in the hospitals during the year in the region	Measure of usage of healthcare facilities
16	Bed turnover rate per month	Average number of patients attended per bed per month in the hospitals during the year, in the region	Measure of usage of healthcare facilities
17	Colleges per 10000 persons	Number of Governmental healthcare colleges x 10000/ total population in the region	Measure of availability of healthcare educational institutions
18	Registered students per 10000 persons	Number of registered students in the healthcare colleges x 10000/ total population in the region	Measure of usage of educational institutions

The study further involved aggregation of healthcare data into the 13 administrative regions and computing the competitiveness metrics for each region. The data for the year 2016 from the MoH Statistical Yearbook[4]was

analyzed and the competitiveness metrics for each dimension were calculated.

The next step was to decide the ideal or standard value for each metric, however, no data was available that specified globally recommended values for the various metrics. It was therefore decided to consider the maximum value of each metric across all regions as the standard value. Accordingly the maximum value of each metric among the 13 regions was calculated. This forms the basis for maximum rating of 10 for that dimension. The competitiveness rating for each region was then computed as follows:

$\text{Competitiveness Rating}_{ij} = \text{Metric}_{ij} \times 10 / \text{Maximum}(\text{Metric}_i)$
Where Rating_{ij}= Competitiveness rating of the i^{th}dimension of the j^{th} region,
Metric_{ij} = Competitiveness metric of the i^{th} dimension of the j^{th} region,
$\text{Maximum}(\text{Metric}_i)$ = maximum value of metric 'i' among all regions
The Competitiveness Index (CI) for a region is defined as the average of all ratings for that region.
Thus, $CI_j = \sum (\text{Rating}_j)/N$,
where,
CI_j= Competitiveness Index of j^{th} region
Rating_{ij}= Competitiveness Rating of the i^{th} dimension of the j^{th} region
$N = \sum i$ = total number of dimensions

The above approach facilitates creation of baselines for each region and for each dimension, for tracking of future improvements in competitiveness.

4. Results

The region wise competitive metrics and ratings are presented in the table 3 and 4 below.

Table 3: Region wise Competitiveness metrics

Dimensions	Riyadh	Makkah	Madinah	Qassim	Eastern Region	Asir	Tabuk
Infrastructure capacity							
No. of hospitals per 10000 persons	0.116	0.115	0.163	0.173	0.138	0.189	0.135
No. of hospital beds per 10000 persons	27.91	16.74	18.52	23.07	24.82	19.58	20.83
No. of health centers per 10000 persons	3.009	1.967	2.250	2.731	2.163	2.911	2.222
No. of pharmacies per 10000 persons	31.10	19.08	20.53	25.77	26.83	22.17	23.04
Quality							
% of CBAHI accredited hospitals	30.11%	27.08%	29.41%	25.00%	39.39%	26.83%	25.00%
Human resource availability							
No. of Physicians per 10000 persons	39.40	22.58	23.30	25.73	29.06	21.19	21.53
No. of Nurses per 10000 persons	81.69	39.18	44.59	52.77	59.62	41.13	49.79
No. of Pharmacists per 10000 persons	11.59	7.77	5.52	5.87	6.83	5.99	5.57
No. of Allied personnel per 10000 persons	46.85	23.22	26.37	41.99	30.86	26.88	25.11
Utilization of healthcare facilities							
No. of outpatients in the year per hospital	491962	228596	257382	230769	385501	174481	247537
No. of inpatients in the year per hospital	10412	6461	6175	5280	7059	3913	4742
No. of emergency visits handled in the year per hospital	24750	35327	75798	67996	37025	37845	71403
No. of Lab tests per hospital	1672633	421590	666580	708849	672350	284504	288420
No. of patients investigated per hospital	45715	36355	49662	32558	44024	18406	29211
Bed occupancy rate of MoH hospitals (%)	62.6	71.575	70.3	68.9	50.333333	64.45	59.9
Bed Turnover Rate per month of MoH hospitals (BTR)	4	5	5	5	4	5	4
Healthcare Education facilities							
No. of Govt. colleges per 10000 population	0.041	0.022	0.029	0.050	0.021	0.023	0.034
No. of Registered students per 10000 population	33.79	17.90	13.96	24.89	9.97	33.07	14.73

Table 3: Region wise metrics (continued)

Dimensions	Hail	Northern border	Jazan	Najran	Al Baha	Al Jouf	Max. value
Infrastructure capacity							
No. of hospitals per 10000 persons	0.219	0.278	0.163	0.246	0.236	0.261	0.278
No. of hospital beds per 10000 persons	18.77	36.47	16.14	23.71	27.12	36.58	36.58
No. of health centers per 10000 persons	3.403	2.310	2.126	2.441	3.795	2.312	3.795
No. of pharmacies per 10000 persons	22.09	38.80	18.95	25.87	29.12	39.54	39.54
Quality							
% of CBAHI accredited hospitals	6.67%	30.00%	4.00%	21.43%	18.18%	0.00%	39.4%
Human resource availability							
No. of Physicians per 10000 persons	23.75	32.15	18.51	26.80	27.81	30.23	39.41
No. of Nurses per 10000 persons	56.76	90.83	38.35	60.58	53.86	47.78	90.83
No. of Pharmacists per 10000 persons	6.25	6.49	4.70	6.04	4.50	6.53	11.60
No. of Allied personnel per 10000 persons	43.28	52.53	32.43	45.47	31.71	36.70	52.53
Utilization of healthcare facilities							
No. of outpatients in the year per hospital	203160	167201	316656	147270	224221	158612	491,962
No. of inpatients in the year per hospital	2993	2790	3016	4813	3181	5562	10,412
No. of emergency visits handled in the year per hospital	54199	45266	56770	48159	47202	55717	75,798
No. of Lab tests per hospital	255793	122039	220827	197432	450003	400139	1,672,633

No. of patients investigated per hospital	28688	16094	33611	24169	22915	21909	49,662
Bed occupancy rate of MoH hospitals (%)	78.9	39.6	66.5	69.3	61.2	52.35	78.900
Bed Turnover Rate per month of MoH hospitals (BTR)	5	3	4	5	5	6	5.900
Healthcare Education facilities							
No. of Govt. colleges per 10000 population	0.073	0.111	0.039	0.088	0.064	0.080	0.111
No. of Registered students per 10000 population	32.86	40.00	56.28	17.99	21.29	47.66	56.28

As described the Methodology section, the competitiveness rating and overall competitiveness index were calculated from the above metrics for each region and dimension. The results of the competitiveness rating are presented in table 4 below.

Table 4: Region wise Competitive Rating

Dimensions	Riyadh	Makkah	Madinah	Qassim	Eastern Region	Asir	Tabuk
Infrastructure capacity							
No. of hospitals per 10000 persons	4	4	6	6	5	7	5
No. of hospital beds per 10000 persons	8	5	5	6	7	5	6
No. of health centers per 10000 persons	8	5	6	7	6	8	6
No. of pharmacies per 10000 persons	8	5	5	7	7	6	6
Quality							
% of CBAHI accredited hospitals	8	7	7	6	10	7	6
Human resource availability							
No. of Physicians per 10000 persons	10	6	6	7	7	5	5
No. of Nurses per 10000 persons	9	4	5	6	7	5	5
No. of Pharmacists per 10000 persons	10	7	5	5	6	5	5
No. of Allied personnel per 10000 persons	9	4	5	8	6	5	5
Utilization of healthcare facilities							
No. of outpatients in the year per hospital	10	5	5	5	8	4	5
No. of inpatients in the year per hospital	10	6	6	5	7	4	5
No. of emergency visits handled in the year per hospital	3	5	10	9	5	5	9
No. of Lab tests per hospital	10	3	4	4	4	2	2
No. of patients investigated per hospital	9	7	10	7	9	4	6
Bed occupancy rate of MoH hospitals (%)	8	9	9	9	6	8	8
Bed Turnover Rate per month of MoH hospitals (BTR)	6	8	8	9	6	8	7
Healthcare Education facilities							
No. of Govt. colleges per 10000 population	4	2	3	5	2	2	3
No. of Registered students per 10000 population	6	3	2	4	2	6	3
Overall average competitiveness	**7.8**	**5.3**	**6.0**	**6.3**	**6.0**	**5.2**	**5.3**

Table 4: Region wise Competitive Rating (continued)

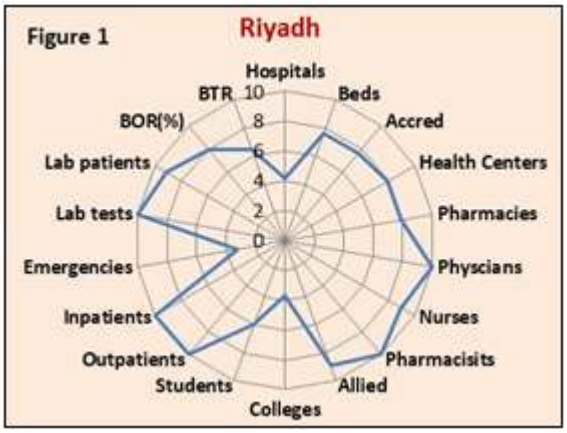
Dimensions	**Hail**	**Northern border**	**Jazan**	**Najran**	**Al Baha**	**Al Jouf**
Infrastructure capacity						
No. of hospitals per 10000 persons	8	10	6	9	8	9
No. of hospital beds per 10000 persons	5	10	4	6	7	10
No. of health centers per 10000 persons	9	6	6	6	10	6
No. of pharmacies per 10000 persons	6	10	5	7	7	10
Quality						
% of CBAHI accredited hospitals	2	8	1	5	5	0
Human resource availability						
No. of Physicians per 10000 persons	6	8	5	7	7	8
No. of Nurses per 10000 persons	6	10	4	7	6	5
No. of Pharmacists per 10000 persons	5	6	4	5	4	6
No. of Allied personnel per 10000 persons	8	10	6	9	6	7
Utilization of healthcare facilities						
No. of outpatients in the year per hospital	4	3	6	3	5	3
No. of inpatients in the year per hospital	3	3	3	5	3	5
No. of emergency visits handled in the year per hospital	7	6	7	6	6	7
No. of Lab tests per hospital	2	1	1	1	3	2
No. of patients investigated per hospital	6	3	7	5	5	4
Bed occupancy rate of MoH hospitals (%)	10	5	8	9	8	7
Bed Turnover Rate per month of MoH hospitals (BTR)	8	4	7	8	8	10
Healthcare Education facilities						
No. of Govt. colleges per 10000 population	7	10	4	8	6	7
No. of Registered students per 10000 population	6	7	10	3	4	8
Overall Competitiveness Index	**6.0**	**6.6**	**5.3**	**6.1**	**5.9**	**6.4**

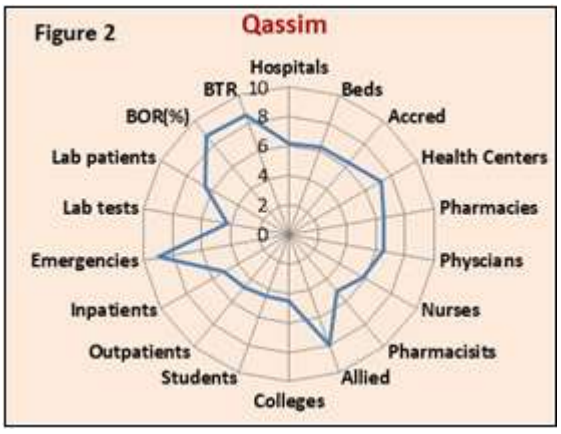
The table 5 shows the ranking of the region in terms of their overall competitiveness index. The region with highest competitiveness index is ranked 1 and that with lowest competitiveness is ranked 13.

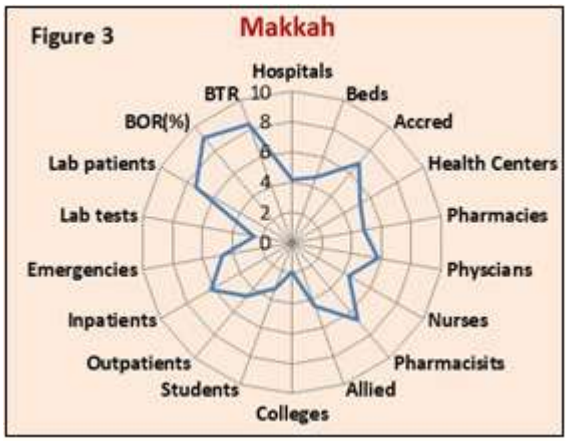
Table 5: Region wise healthcare competitiveness ranking

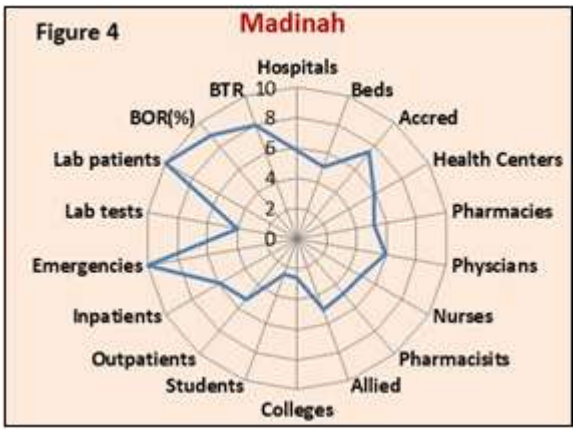
Rank	Administrative Region	Competitiveness Index
1	Riyadh	7.8
2	Northern Border	6.6
3	Al Jouf	6.4
4	Qassim	6.3
5	Najran	6.1
6	Madinah	6.0
7	Hail	6.0
8	Eastern Region	6.0
9	Al Baha	5.9
10	Makkah	5.3
11	Tabuk	5.3
12	Jazan	5.3
13	Asir	5.2

The following graphs show the competitiveness along different dimensions for four regions, as samples.









These graphs provide an insight into the strong and weak areas of competitiveness of the region. Understandably, Riyadh being the Capital city, the Riyadh region shown higher level of competitiveness for all dimensions as compared to other regions of the kingdom.

5. Discussion

The results demonstrate the efficacy of the proposed model in depicting regional competitiveness of healthcare sector in Saudi Arabia, as stated in the objectives. This study is unique of its kind which focuses specifically on assessing the regional competitiveness of healthcare sector. The model was also applied to evaluate the regional healthcare competitiveness of 13 regions of the Kingdom of Saudi Arabia for year 2016. It was observed that the Riyadh region had the highest competitiveness index while Asir region had the lowest index. Nothern border region scored high rating on infrastructure availability while Eastern region had a high score on educational facilities. Thus it can been seen that application of this model facilitates identification of strong and weak areas or dimensions of the region and allows the administrators to focus their efforts in bringing about improvements in weak areas. This model will also help the administrators to plan resources and budget allocation for the regions. The model could be further improved by adding more dimensions like patient feedback, technological capabilities, skills of human resources etc. The model also opens scope for the extension of this concept to other industrial sectors.

6. Conclusion

A model for measurement of regional healthcare competitiveness was developed in this study and was applied to the regions of the Kingdom of Saudi Arabia. The regional competitiveness was measured across 18 dimensions which were broadly categorized into infrastructure capacity, availability of human resources, quality, utilization of facilities and availability of educational facilities. It was observed that the healthcare competitiveness index of Riyadh region was the highest and that of Asir region was the lowest. The proposed model may be useful to the administrators for monitoring the performance of healthcare sector in the region, resource allocation, budgeting and identifying the weak areas, for improvement. The model allows further scope for enhancement and refinement in terms of adding further dimensions of competitiveness.

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