

# The Assessment of the Relationship between Dental College's Intakes and Management of the Dental Human Resources in Sudan 2020.

Comment [m1]:

## Abstract

Dentistry profession has expanded in recent years to cover a large set of prevention and treatment modalities due to increased demand of oral health services as result of change in population Demographics, the increased demand for dentists has led to establishment of many dental colleges with overall number of 32 dental colleges in Sudan, and average number of 1200 graduates in 2019 from 15 dental colleges. A descriptive cross sectional – institutional based study was carried out, Data was collected using secondary data including statistical records of MOH, Ministry of higher education and other related institutions, Also, a questionnaire was administered for convenience sample of dentists and dental students (100 dentists/100 dental students) in order to assess their career plans and possibility to serve inside Sudan, the quantitative data was analyzed using SPSS version 22 (confidence level of 95%). 45% of the total public sector dentists are in Khartoum and 33% of dentists based on career planning assessment won't work outside Khartoum irrespective to income. The career plan assessment showed that 61.3% of dental students have emigrational plans as well as 91% of dentists, with most of dentists were not satisfied about their employment status. The findings highlight that assigned dentists in both public and private sectors in Sudan are less than WHO recommended dentists population ratio, therefore number of working dentists in public and private sectors are very low in other different states than Khartoum, so it's important to set a rational annual students intake number in dental colleges rather than altering colleges numbers, also authorities should adopt decentralization strategies as well as Inter-sectoral collaboration between Ministry of Health (FMOH) and Ministry of Higher Education to establish strategies for dental student's intake, Furthermore comprehensive review of dental human resources in Sudan to be done in 2025 as there is new 16 dental colleges are going to graduate students for the first time.

Comment [m2]: Correct grammatical error

## Keywords

*Health System, Dentistry, dental students, Dental colleges, Human resources, Dental education, dental training, Oral health, Higher education, career plan, job satisfaction*

## 1. Introduction

Dentistry as a profession is concerned with prevention and treatment of oral diseases and encompasses treatment and correcting patient's malformations of the jaws, misalignments of the teeth and birth anomalies, furthermore in early days of the profession both training and practice was unregulated and virtually unrestricted (2). Practicing dentistry became regulated at different times in different countries through many regulations which aimed to serve two purposes: to restrict admission to the profession and to ensure safe and knowledgeable practice. Regarding the admission process, dental education was limited to medical students who generally performed dental work only within the context of their medical practices and the next step was the opening of formal dental schools, these dental schools provided the education necessary to enter into the profession until the founding of current dental colleges and internship programs for dental practice.

In Sudan the Health system has undergone rapid changes by facing numerous new challenges of changing demographics, disease patterns, emerging and reemerging diseases coupled with rising costs of health care delivery that forced a comprehensive review of health systems and their functioning (3). Dentistry as one of the main health domains with indispensable service demands that's concerns with wide range of preventive and surgical treatments has also been affected by health system strategies in Sudan in terms of numbers, quality, distribution and continuous education for health provides, since that Entry portal of dentists into health system starts officially with enrollment into one year Internship program set by Sudan's medical council and Directorate of health human resources in Federal Ministry of Health , the internship program is composed of six training shifts including; Oral and Maxillofacial surgery, Periodontics, Pedodontics, Dental Public Health , Conservative & Endodontics and Prosthodontics (4). The number of dental schools in recent years have raised to 35 dental colleges all over the country with an average number of 1200 dentists graduated on 2019 from 15 dental colleges, meanwhile most of the graduated dentists since 2020 have been out of the health system training pipeline due to lack of training center vacancies to accommodate fresh graduated dentists in internship; which indicates imbalance between number of graduates and available vacancies for training and employment(5), the lack of Co-ordination between the Human Resources Directorate In FMOH and the Ministry of Higher Education has affected organization process of

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dental graduate's numbers from newly established universities and ability to identify the problem co- factors in terms of continuous endorsement of new colleges establishment, its average annual intake , geographical distribution of these colleges and the available hospitals and dental care settings to accommodate dentists. Moreover, policy of "expansion and decentralization of higher education" adopted in 1994 including local postgraduate **studieshadaimedto** increase production with focus on priority needs of certain regions to overcome the short coming in-service delivery in many de-privileged areas (6),the policy activated had served **a little bit** the strategy of establishment of Medical schools **meanwhile still there is** a geographical distribution imbalance regarding number of dental colleges in Khartoum and dental colleges in other states, taking into account the value of decentralization of dental schools for retention of dental staff as well as the role of colleges dental clinics in peripheral states to provide dental services for the state's local population.

**Comment [m4]:** Typographical error

**Comment [m5]:** May be altered as 'in some measure'

**Comment [m6]:** Maybe altered as 'there remains a'

The importance of assessment of the relationship between dental colleges intake and demands of the health system come from the fact of **that,inspite** of clear expansion of both number of Dental Schools and number of new professionals that should contribute in saturation of the dental market, yet there is imbalance between actual needs in some areas and the annual graduate's number as result of improper management of dental **manpower.Also**qualified dentists pass through intake stage and training stage which affect the quality and availability of dental service as result of long clinical gap after graduation and delay of official engagement into health system.

**Comment [m7]:** Typographical error

**Comment [m8]:** Typographical error

**Comment [m9]:**

**Comment [m10]:** Multiple typographical errors in following paragraphs too

## 2. Materials and methods

This is Descriptive cross sectional – institutional based study, which took place in Federal Ministry of Health (FMOH), Khartoum State Ministry of Health (SMOH), Sudan Medical Council and Ministry of Higher Education. The Curative medicine directorate and Directorate of Health Human Resources are the principal FMOH directorates concern with dental human resources management, also the **DentalDepartmentat** Private Curative Institutions Directorate as well as Oral Health Directorate are the main relevant directorates at Khartoum State Ministry of Health.

**Comment [m11]:**

**2.1.Data Collection:**The data was collected from existingsecondary data including records of number of dental providers, facilities, regulations, dental facilities and regular college's intake from all dental training hospitals, colleges and relevant institution and directorates.

Comment [m12]:

Self-administrative closed ended questionnaire was allocated to assess career plans of 200 dentists and dental students on which Quota sampling for participants selection was done based on categorization of (dentists / dental students) as well as type of dental colleges (governmental / Private), Pre testing was done to ensure quality of career plan survey questionnaire.

**2.2.Data Management:**Data was entered, cleaned, and analyzed using SPSS version 22.Statistical records of Existing data were presented on frequency tables with percentages, graphs and charts.

Significance tests used:chi-square testfor categorical variables and t-testfor quantitative data, with Confidence level of 95% and P value 0.05 % or less which is considered statistically significant.

Comment [m13]:

Comment [m14]:

### 3. Results:

❖ **Table (1): Number of registered dentists at Sudan's Medical Council**

Category	Number
Primary registration	3788 (37%)
Permanent registration	5928 (58%)
Specialists	503 (4.9%)
<b>Total</b>	<b>10.219</b>

The Table above shows that high number of graduated dentists on waiting list with average of (37%) from total registered dentists and 6,431 are fully licensed (63%).

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❖ **Table (2): Number of general dentists in different states of Sudan**

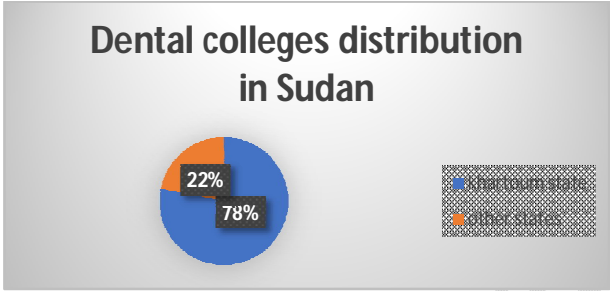
Num	Name of The state	Number of general practitioners
1	Northern State	8 (4%)
2	Gadareef	7 (3.5%)
3	Kassala	8 (4%)
4	Red sea	21 (10.5%)
5	Northern Kordofan	13 (6.5%)
6	Western Kordofan	5 (2.5%)
7	Southern Kordofan	2 (1%)
8	Jazeera State	87 (43.5%)
9	Blue Nile	5 (2.5%)
10	White Nile	4 (2%)
11	River Nile	5 (2.5%)
12	Sennar	11 (5.5%)
13	North Darfur	7 (3.5%)
14	West Darfur	6 (3%)
15	East Darfur	2 (1%)
16	South Darfur	7 (3.5%)
17	Middle Darfur	2 (1%)
Total		200

The table above shows a total average of 200 general dentists assigned to work on behalf of 17 States ministries of health excluding Khartoum state, the table shows that most of these dentists are assigned in Gezira State (43.5%) and the least numbers in Middle and East Darfur states (only 2%).

**Table (3):Number of specialist's dentists in Different states of Sudan except Khartoum**

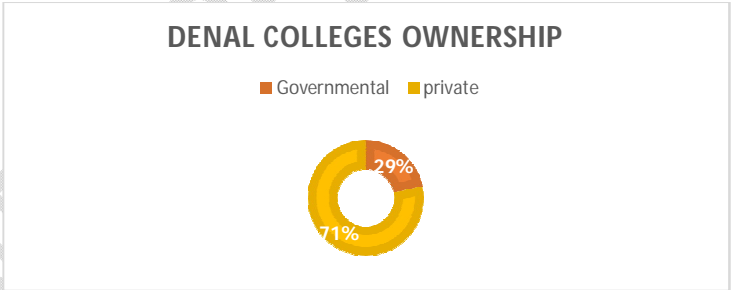
Num	Name of The state	Number of specialists	Num	Name of The state	Number of specialists
1	Northern State	0 (0%)	10	White Nile	0 (0%)
2	Gadareef	1 (5.2%)	11	River Nile	1 (5.2%)
3	Kassala	1 (5.2%)	12	Sennar	0 (0%)
4	Red sea	1 (5.2%)	13	North Darfur	2 (10.5%)
5	Northern kordofan	2 (10.5%)	14	West Darfur	0 (0%)
6	Western Kordofan	1 (5.2%)	15	East Darfur	1 (5%)
7	Southern Kordofan	0 (0%)	16	South Darfur	1 (5%)
8	Jazeera state	7 (36.8%)	17	Middle Darfur	0 (0%)
9	Blue Nile	1 (5.2%)	<b>Total</b>		<b>19</b>

The Table above shows lack of number of specialists in different states with total absence of specialist in 6 States including Middle Darfur, West Darfur, White Nile, Sennar, South Kordofan and Northern State.



**Figure (1): Dental College’s distribution in Sudan**

The figure above shows distribution of (25 dental colleges in Khartoum / 7 dental colleges in different 5 states including 2 in Red Sea, 2 in Al-Jazeera, North Darfur, River Nile and North kordofan)



**Figure (2) Dental Colleges Ownership**

The figure above shows that private sector dominance with 23 dental colleges from total of 32 colleges

❖ **Table (4): Governmental Dental colleges, average intake and geographical location**

Num	Name of college	Average intake (2019)	Target intake number (2020)	Location (state)
1	University of Khartoum	82 (17.9%)	50 (14.9%)	Khartoum
2	University of Gezira	50 (10.9%)	35 (10.4%)	Gezira
3	Neelain University	60 ( 13.1%)	40 (11.9%)	Khartoum
4	Sudan University of Science and technology	60 ( 13.1%)	60 (17.9%)	Khartoum
5	University of Shendi	60 (13.1%)	60 (17.9%)	River Nile
6	University of Red Sea	-	-	Red Sea
7	AlzaeimAlazhari University	50 (10.9%)	50 (14.9%)	Khartoum ( Bahri)
8	Alfasher University	35 (7.6%)	40 (11.9%)	Northern Darfur
9	Kordofan University	60 (13.1%)	-	North Kordofan
<b>Total</b>		457	335	

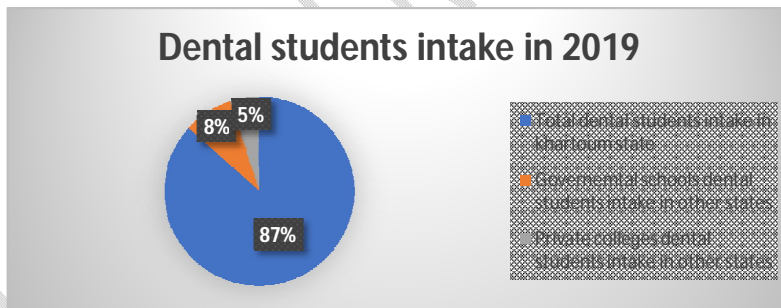
The Table above shows the average of public accommodation intake on first grade at governmental sector (the number of private intake student = Public Accommodates / 2)

❖ **Table (5): private Dental colleges, average intake and target and geographical location**

Num	Name of college	The target intake number (2019)	Average intake		Location
			Male	Female	
1	Alrebat University	103 (5.1%)	19	84	Khartoum
2	Karary University	85 (4.2%)	15	70	Khartoum ( Omdurman )
3	International university of Africa	85 (4.2%)	9	76	Khartoum
4	Sudan International University	108 (5.4%)	39	69	Khartoum
5	University of science and technology	66 (3.3%)	15	51	Khartoum ( Omdurman)
6	University of Medical science and technology	94 ( 4.7%)	2	4	Khartoum
7	The National university	113 (5.6%)	9	20	Khartoum
8	Al-RazyUnivrsty	188 (9.4%)	20	58	Khartoum
9	University of Garden City	71 (3.5%)	2	2	Khartoum
10	Ibn Sina University	122 (6.1%)	7	21	Khartoum
11	The Nile Universiy	103 (5.1%)	2	13	Khartoum ( Bahri)
12	Albayan College	75 (3.7%)	7	25	Khartoum
13	Al-Menhal Academy of science	56 (2.8%)	2	2	Khartoum ( Bahri)
14	Al-Yarmook College	56 (2.8%)	5	12	Khartoum
15	Iqra college of science and technology	47 (2.3%)	3	9	Jazeera state ( Fadasi)
16	East Sudan College for medical sciences and technology	75 (3.7%)	3	18	Red Sea state ( Portsudan)
17	Nahda College	71 (3.5%)	2	6	Khartoum
18	Nepta college	71 (3.5%)	6	7	Khartoum
19	Al-Fajr college of science and technology	71 (3.5%)	1	6	Khartoum

20	Hayat college	71 (3.5%)	4	11	Khartoum
21	Imperial College	75 (3.7%)	18	57	Khartoum
22	Al-Madaien college	113 (5.6%)	1	13	Khartoum
23	Riyadh international college	66 (3.3%)	1	7	Khartoum
<b>Total</b>		<b>1985 (Actual Target)</b>			

The table above shows the average intake at private colleges in 2019 excluding the foreign students, mature learning students and direct applicants of the program according to Higher Education Ministry



**Figure (3) Dental College's intake in 2019 in Khartoum state compared to other states**

The figure above shows dominance of dental student's intake in Khartoum state compared to other states which represent only 13% of total students in Sudan (8% governmental, 5% private).

**Comment [m15]:** If division of government to private is depicted in other states, why not in Khartoum?

**Table (6): Number of recently graduated dentists from dental colleges:**

College	Number of graduates on recent years	College	Number of graduates on recent years
University of Khartoum	139 (2020) / 135 / 121	Sudan intentional university	85 (2020) /80 / 59
Karary University	84 (2020) / 69 / 70	University of medical science and technology	29 (2020) / 48 / 60
Neelain University	79 (2020) / 59 / 39	University of science and technology	69 (2020) / 73 / 70
University of Gezira	85 (2020) / 95/45 (Gezira State)	Nationl University	110 (2020) /120 /90
National Rebat University	80 (2019) / 64 / 93	Alrazy University	97 (2020) / 109 / 60
Nahda University	42 (2020) / 6	East Sudan college (Red Sea State)	26 (2019)
Ibn Sina University	85 (2019) / 73 / 78	International University of Africa	125 (2019) (57 Sudanese) / 82 (69 Sudanese) /
Al-Yarmook college	70 (2020) / 45 / 40		
Nile University	35 (2020) /28 /25		

The table above shows that total of 16 colleges have released graduates up to December 2020 including the last batch graduation year (1240 graduates) only 111 are from out of khartoum + number of graduates on the past years respectively..

❖ **Table (7): Public sector's Dental workforce in Khartoum state:**

Num	Name of Locality	Total Number of dental clinics	Number of general practitioner dentists + contractors dentists + National service dentists	Number of specialists	Total dentists = 182	Categories of working clinics		
						Hospital clinic	Referential center	Small unit
1	Khartoum	28 (17%)	54 (31%)	3 (37.5%)	57 (31%)	3 (11%)	21 (28%)	4 (7.4%)
2	JabalAwleya	24 (14.7%)	27 (15.5%)	-	27 (14.8%)	2 (7.4%)	12 (16%)	10 (18.5%)
3	Bahri	31 (19%)	29 (16.6%)	4 (50%)	33 (18.1%)	5 (18.5%)	11 (14.6%)	15 (27.7%)
4	East Nile	22 (13.4%)	18 (10.3%)	-	18 (9.8%)	5 (18.5%)	6 (8%)	7 (12.9%)
5	Um Bada	22 (13.4%)	10 (5.7%)	-	10 (5.4%)	3 (11%)	7 (9.3%)	9 (16.6%)
6	Karary	18 (11%)	21 (12%)	-	21 (11.5%)	5 (18.5%)	8 (10.6%)	5 (9.2%)
7	Omdurman	18 (11%)	15 (8.6%)	1 (12.5%)	16 (8.7%)	4 (14.8%)	10 (13.3%)	4 (7.4%)
<b>TOTAL</b>		<b>163</b>	<b>174</b>	<b>8</b>	<b>182</b>	<b>27</b>	<b>75</b>	<b>54</b>

The table above shows number of working dentists on governmental sector with only 8 specialists assigned on the Oral Health Directorate of Khartoum State (only 4% of all dental staff are specialists).

❖ **Table (8): Khartoum Major Dental hospitals workforce:**

Name of Hospital	Number of general dentists	Number of registrars	Number of specialists	Average house officers intake monthly	Total
<b>Khartoum dental teaching hospital</b>	25 (14.2%)	50 (28.4%)	51 (28.9%)	50 (28.4%)	<b>176</b>

<b>Military Hospitals (Armed Forces + police)</b>	40 (Omdurman) / 20 (Police) (32.4%)	15 (Omdurman)/ 12 (police) (14.5%)	14 (Omdurman) / 14 (police) (15.1%)	70 (37.8%)	<b>185</b>
<b>HajAl-safi Hospital</b>	20 (58.8%)	13 (38.2%)	1 (2.9%)	20 per month (not constant)	<b>34</b>
Total				<b>140</b>	<b>395</b>

The table above shows the working staff number on Khartoum dental teaching hospital has average of 28.4% of total working staff as house officer intake recently, total of 185 dentists in Military hospitals that contribute to dental service coverage for military staff families and thereby staff accommodation

❖ **Table (9) private Dental clinics and centers in Khartoum state:**

Main city	Number of general practitioners	Number of specialists	Number of dental clinics	Number of dental centers
Khartoum	210 (45.2%)	39 (43.8%)	249 (45%)	62 (81.5%)
Bahri	129 (27.8%)	19 (21.3%)	148 (26.7%)	6 (7.8%)
Omdurman	125 (26.9%)	31 (34.8%)	156 (28.2%)	8 (10.5%)
Total	<b>464</b>	<b>89</b>	<b>553</b>	<b>76</b>

The table above shows the number of dental clinics and centers in Khartoum state with focus in Khartoum localities which own 45% of dental clinics and 81.5% of dental centers from total of 629 dental private facilities in Khartoum state.

❖ **Table (10) Total number of specialists in Khartoum state compared to other states assigned in public sector / owning private centers**

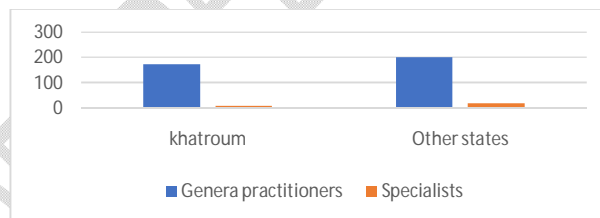
State	Number of specialists
Khartoum state	162 (89.5%)
Other states	19 (10.5%)
Total	181

Table above shows number of specialists assigned to public sector or having dental centers and clinics with a proportion of 89.5% in Khartoum state excluding those working on higher education institutions or part time contractors in private centers.

❖ **Table (11) Total Dentists workforce of Public sector in Sudan**

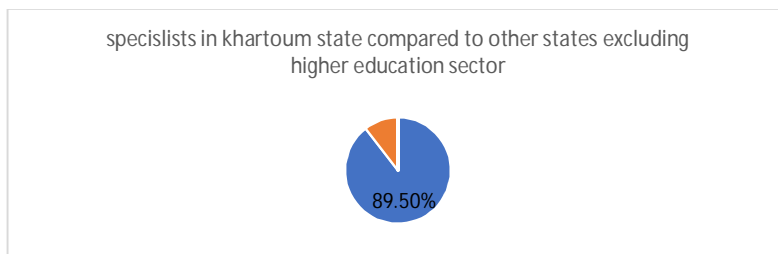
The place	Number
Khartoum dental teaching Hospital	176 (22%)
Military Hospitals ( Omdurman + Police)	185 (23%)
Haj Alsafi Hospital	34 (4.2%)
Primary health care centers in Khartoum	182 (23%)
States public sector total dentists	219 (27.5%)
<b>Total</b>	<b>796</b>

The table above shows that total number of dentists have official jobs in public sector across Sudan



**Figure (4) Public sector working dental staff in Khartoum state (PHC dental clinics) compared to other different states**

The figure above shows marked variation in number of public sector assigned dentists in Khartoum state compared to other 17 states (Khartoum state = 174 GP & 8 specialists) 45% / (other states = 200 GP & 19 specialists) 55%.



**Figure (5) total number of specialists in Khartoum state**

The figure showed that (89.5%) of total specialists in Khartoum state compared to other states

### Conclusion

The findings of this study highlight that:

- Sudan registered number of dentists is apparently more than WHO recommended dentists: population ratio in total, but still number of working dentists on behalf of public and private sectors is very low relative to total population number.

Severe shortage of dentists in other states, since most of assigned dentists are working in Khartoum state with total absence of specialists in some other states which affected training of dental house officers and service delivery into these areas.

- The number of students intake in dental colleges in Sudan is not based on actual geographical needs, so total number of governmental and private dental colleges must to expanded to cover 11 states that have no dental college at all.

- Setting of rational annual intake number at these college because its more vital for needs coverage than colleges number, also the study showed that the dental internship program is centric based, due to lack of vacancies and supervision in other states, therefore possibility of retention of dentists at the peripheral states is markedly compromised.

Moreover, 62.9% (6431 dentists) of the total registered dentists at Sudan's Medical Council are fully licensed dentists who are able to work solely without supervision needs, and thereby fully sub serve the need of the health system whenever possible.

- The current demand will be minimized to 1/3 recommended value by giving a ratio of dentist in every 21,536 through the current graduates in 2019 from only half of total established colleges.

▪ The study showed that most of dentists are not satisfied about their employment status and most of them consider migration as front option, also most of dental students at governmental colleges may serve in peripheral states in case of proper settings, as well as some dentists consider career shift from dental domain as principal plan

## References

1. B.A.Dye .The Global Burden of Oral Disease: Research and public health significance. *Journal of Dental Research*. 2017 Feb. (cited 2017). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC672866938>
2. Andrew I Spielman. A short history of Dental Education. New York. Research gate. 2019. page 1.
3. health system profile- Sudan (2006). Regional health system observatory (2006). WHO.
4. <https://www.worldometers.info/world-population/sudan-population/>
5. [ahref='https://www.macrotrends.net/cities/22579/khartoum/population'](https://www.macrotrends.net/cities/22579/khartoum/population)>Khartoum, Sudan Metro Area Population 1950-2021</a>. [www.macrotrends.net](http://www.macrotrends.net). Retrieved 2021-05-07.
6. Health system profile- Sudan (2006). Regional health system observatory (2006). WHO.