

## **Calorific and Nutrients Content in Normal, Diabetic and Enteral Diets Served in Four Hospitals of Ministry of Health in Riyadh**

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**Abstract.** Normal, diabetic and enteral diets in four hospitals of Ministry of Health in Riyadh were analyzed for their calorific and nutrients content. The study covered the actual calories and nutrient content available for the patients on their meal tray. Both techniques (laboratory analysis and food composition tables computation) were used to determine the available calories and nutrients on the meal trays served to the patients. The results clearly indicated that the worldwide statement of the existence of more than 35% malnourished hospitalized patients, if applicable in the Kingdom, could be attributed to other causes rather than the availability or shortage of nutrients in patient's meal tray. Diets were assessed against patients recommended allowances and recommendations were set for improvement. These include adherence to the Ministry of Health, Nutrition Manual, giving special attention to the diabetic and tube feeds and correcting the low fiber content in some diets.

**Keywords.** Calorie content: normal diet, diabetic and enteral diet, MOH

### **Introduction**

Diet manuals are necessary to run an organized food and nutrition services in any hospital. The Ministry of Health (MOH) in the Kingdom of Saudi Arabia has introduced its new Diet and Food Services Manual [1] taking into consideration the drawbacks of the old one together with the increasing demand for updated hospital food services.

The worldwide increasing awareness of the prevalence of malnutrition among hospitalized patients, has put its toll on the future plans and strategies of any nutrition or health planner, since investigations during the last few decades estimated a high prevalence of 35% or more [2,3,4]. The relationship between patient's malnutrition and the risk of nutrition associated complications was also evident [4].

Malnutrition occurs among patients because either of their disease or the treatment procedure preventing them from receiving adequate nutritional intake for prolonged periods or above all the meals given to them are not sufficient to meet their nutritional requirements for one reason or another.

Around 80% of the diets served in the MOH hospitals are normal, 10% are diabetic and the rest differ according to the type of hospital.

The main objective of this study is to evaluate the calorific and nutrient contents of the two main diets (normal and diabetic) as well as the enteral in order to check the abidance to MOH Diet Manual and thus the availability or shortages of nutrients in the patient meal tray.

**Material and Methods**

Four MOH hospitals in Riyadh city were chosen to conduct the study as shown in Fig. 1.

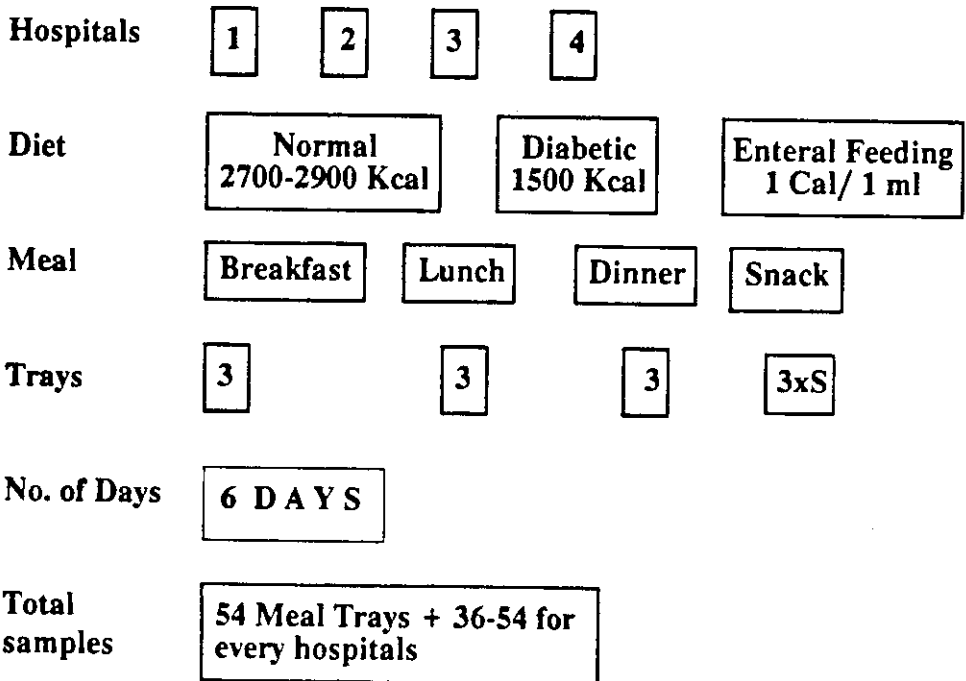


Fig. 1. Methodology followed in collecting the samples.

Three trays each of normal and 1500 Kcal, diabetic diet's meal (breakfast, lunch, dinner and the accompanying snacks) from the four hospitals, were collected, itemized, weighed, packed, labeled and transferred to the laboratory for analysis. The collection of the daily samples continued for 6 consecutive days making a total collection of 54 meal trays and 36-54 snack trays from each hospital.

Samples were also collected from the hospitals prepared enteral feeds, when used, having a calorific density of 1 Kcal per ml distributed among carbohydrate (COH), protein and fat in the ratio of 55:15:30, respectively.

Proximate analysis of the edible portions were carried out on the samples according to the Saudi Standards [5]. Nutrients and calorific values were also obtained by computation using the Middle East Food Composition [6]. Both values were compared against the recommended dietary allowance (RDA) [7].

### Results and Discussion

The proximate analysis and mean calorie values of the edible portion of the normal diet in the four selected hospitals of MOH in Riyadh are illustrated (Table 1). The calories served ranged from 3180 to 4110 with a mean value of  $3790 \pm 260$ . The daily mean carbohydrates, protein, fat and fiber served were  $548.62 + 45.02$ ,  $168.12 \pm 15.89$ ,  $102.40 \pm 14.84$  and  $9.58 \pm 3.58$  gm respectively. This approximates to 58:18:24 ratio of energy distributed among carbohydrate, protein and fat, respectively.

Although the individual figures for the calories available on the patient's tray differed among the four hospitals, but the mean value of  $3790 \pm 260$  is still higher than what is recommended in the MOH Diet Manual of 2700-2900 calorie. But one should consider the possible hospital edible plate waste which might constitute a recognizable portion of the patient's meal [8,9]. It is also clear that the carbohydrate: protein: fat ratio needs a proper adjustment to go with the recommended 60:15:25 ratio, respectively.

The proximate analysis and the calorie mean values of the edible portion of the diabetic diet are shown in Table 2. The mean calorie served in the selected four hospitals ranged from  $1780 \pm 154$  to  $2325 \pm 120.4$  with a mean value of  $2090 \pm 134.8$  calorie of the four hospitals. It was clear that the total energy served exceeded the requested 1500 Kcal by almost 40%. The carbohydrate: protein: fat were in the ratio of 51:24:25. The protein was high and almost double the recommended value.

Only two hospitals were preparing their tube feeding from fresh products in their kitchens. The one Kcal per ml. requested was 26-29% lower and the carbohydrate: Protein: Fat ratio was 70:16:14 compared to the requested 55:15:30, respectively (Table 3). This indicates the difficulties encountered in preparing tube feeds in hospital kitchen

**Table 1. Proximate analysis and calorific content of normal diet of the selected MOH Hospitals in Riyadh**

Hospital No.		Sample Wt.(gm)	Moisture (gm)	Ash (gm)	Fat (gm)	Protein (gm)	CHO (gm)	Fiber (gm)	Energy (Kcal)
1	Mean	3279	2358.28	32.72	111.85	191.32	575.00	10.20	4070
	(%)		(71.92)	(0.99)	(3.41)	(5.83)	(17.53)	(0.32)	
	SD±	112.77	96.76	1.42	14.01	17.90	24.57	5.34	257.05
2	Mean	2860	1998.63	28.82	102.85	166.13	553.43	9.80	3800
	(%)		(69.880)	(1.00)	3.59	(5.84)	(19.35)	(0.34)	
	SD ±	154.23	167.79	2.60	17.32	10.28	57.49	3.34	296.14
3	Mean	3135	2211.88	28.87	114.77	170.00	599.18	10.67	4110
	(%)		(70.54)	(0.92)	3.66	(5.42)	(19.12)	(0.34)	
	SD ±	121.07	105.20	3.54	15.41	14.90	33.57	3.78	92.15
4	Mean	2656	1934.17	22.53	80.13	145.02	466.85	7.65	3180
	(%)		(72.82)	(0.85)	3.02	(5.45)	(17.58)	(0.28)	
	SD ±	230.97	166.66	3.23	12.62	20.48	63.25	1.84	389.09
	Mean	2982.67	2125.64	28.23	102.40	168.12	548.62	9.58	3790
	(%)		(71.27)	(0.95)	3.43	(5.63)	(18.40)	(0.32)	
	SD ±	154.76	134.10	2.70	14.84	15.89	45.02	3.58	260.02

**Table 2. Proximate analysis and calorific content of diabetic diet of the selected MOH Hospitals in Riyadh**

Hospital No.		Sample Wt.(gm)	Moistur e (gm)	Ash (gm)	Fat (gm)	Protein (gm)	CHO (gm)	Fiber (gm)	Energy (Kcal)
1	Mean	2490	1964.8	26.43	59.63	142.25	303.23	11.23	2325
	(%)		8	(1.08)	(2.39)	(5.71)	(12.18)	(0.45)	
	SD±	131.22	(78.19)	1.41	8.68	13.99	)	3.14	120.39
2	Mean	2678	2258.5	25.23	49.15	113.90	219.80	11.07	1780
	(%)		5	(0.94)	(1.84)	(4.25)	(8.21)	(0.24)	
	SD ±	179.22	(84.34)	1.77	6.27	8.41	25.06	2.42	153.92
3	Mean	2801	2289.5	30.05	62.82	133.88	274.47	10.15	2200
	(%)		2	(1.08)	(2.24)	(4.78)	(9.80)	(0.36)	
	SD ±	117.14	(81.74)	1.87	6.45	10.38	15.10	1.11	86.22
4	Mean	2327	1864.6	19.76	61.52	112.18	263.53	5.73	2060
	(%)		5	(0.85)	(2.64)	(4.83)	(11.32)	(0.23)	
	SD ±	127.44	(80.13)	2.01	12.09	5.63	)	1.09	178.89
	Mean	2573.8	2089.9	25.35	58.28	125.55	265.26	9.55	2090
	(%)	8	0	(0.98)	(2.26)	(4.88)	(10.30)	(0.38)	
	SD ±	138.76	(81.20)	1.76	8.37	9.60	)	1.94	134.86
			119.39				23.42		

from fresh products compared to the use of ready made tube feeds advised in MOH manual.

**Table 3. Proximate analysis & calorific content of nsogastric diet (Kcal/ml) of the selected MOH hospitals in Riyadh**

Hospital number	Calories requested	Sample Wt.(gm)	Moisture (gm) (%)	Ash (gm) (%)	Fat (gm) (%)	Protein (gm) (%)	CHO (gm) (%)	Fiber (gm) (%)	Emergency	
									(Kcal)	Kcal/ml
									Total	
2	1200	806	682.80 (84.71)	9.40 (1.17)	11.90 (1.48)	24.20 (3.001)	76.60 (9.51)	0.97 (0.13)	510	0.63
2	1500	1067	876.40 (82.13)	4.80 (0.45)	17.50 (1.64)	28.40 (2.66)	139.00 (13.02)	1.28 (0.12)	830	0.78
2	1800	1022	863.50 (84.49)	4.50 (0.44)	18.60 (1.82)	29.20 (2.86)	105.20 (10.29)	1.02 (0.10)	710	0.69
4	1200	270	228.00 (84.45)	0.90 (0.34)	5.60 (2.08)	5.30 (1.97)	29.90 (11.08)	0.19 (0.08)	190	0.70
4	1200	247	207.85 (84.15)	0.90 (0.36)	7.60 (3.07)	5.60 (2.27)	24.90 (10.08)	0.17 (0.07)	190	0.77

The Middle East Food Composition Tables were used for the computation of nutrients and caloric mean values of the edible portions of the normal and diabetic diets served in the selected four hospitals. The results are shown in Tables 4 and 5 respectively. There were no major differences in the computed values compared with the laboratory results revealing that the Middle East Food Composition Tables could fairly be used in the absence of a Saudi Food Composition Tables.

It is clear from (Table 4) that the served normal diet supplied almost all the required nutrients estimated as compared to RDA. Available fiber on the patient's tray was almost 50% or more less than the recommended daily intake of 20-40 gm. The diabetic diet (Table 5) followed the same pattern with regard to the availability of nutrients compared to the RDA, respectively. Knowing that the requested calories were 1500, that means reduction of the above RDA figures by almost 40%. This indicated that 1500 Kcal Diabetic diets should be adjusted to meet the requirements accordingly.

### Conclusions

The study indicated that the served normal diet in the selected hospitals of MOH provided more energy, probably more nutrients than recommended in the MOH Diet Manual. Diabetic diets need special attention as well as the Tube Fees. RDA were met by all the macro nutrients. Supplementation could be used to help in correcting some

Table 4. Computed nutrients and caloric content of normal diets served in the selected MOH Hospitals in Riyadh\*

Hosp. No.	Protein (gm)	Fat (gm)	CHO (gm)	Energy (Kcal)	Fiber (gm)	Ca (mg)	Phos (mg)	Fe (mg)	Retinol (µg)	B1 (mg)	B2 (mg)	Niacin (mg)	Vit.C (mg)
1	Mean	161.25	121.33	665.84	4390	9.90	1839.51	22.75	1301.00	2.84	3.33	28.41	238.68
	SD ±	11.57	14.60	27.55	284.44	2.23	192.62	2.28	325.14	0.37	0.27	1.84	71.02
2	Mean	131.44	87.96	588.47	3670	9.17	1300.28	2679.97	1401.52	3.59	3.65	43.88	161.47
	SD ±	11.34	12.26	49.76	209.04	1.98	355.24	835.21	222.33	1.14	1.65	19.95	70.93
3	Mean	142.03	117.39	358.52	3890	9.75	1199.89	2313.13	988.34	2.81	2.65	32.14	319.39
	SD ±	11.06	29.57	267.80	171.71	2.86	326.38	392.74	473.07	1.22	0.82	8.83	59.93
4	Mean	131.73	86.14	478.13	3210	8.64	1361.32	2365.15	613.69	2.17	3.12	34.38	239.41
	SD ±	16.06	14.85	41.38	293.13	1.51	368.43	572.67	182.49	0.66	1.15	11.22	74.19
%	Mean	141.60	103.2	522.7	3790	9.37	1425.2	2489.1	1076.1	2.9	3.2	34.7	239.7
	SD ±	12.51	17.82	96.62	239.58	2.15	310.67	507.97	300.76	0.8	1.0	10.46	69.02
RDA	%	224.8	137.6	129.1	130.69	31.2	178.13	311.14	107.6	190	188	182.6	399.6

\*Nutrients were computed according to Food Composition Table for use in the Middle East [6]

Table 5. Computed nutrients and calorific content diabetic diet in the selected MOH hospitals in Riyadh

Hosp. No.	Protein (gm)	Fat (gm)	CHO (gm)	Energy (Kcal)	Fiber (gm)	Ca (mg)	Phos (mg)	Fe (mg)	Retinol (ug)	B1 (mg)	B2 (mg)	Niacin (mg)	Vit.C (mg)	
1	Mean	119.87	82.79	360.82	2660	8.22	1272.66	2003.72	19.27	873.48	2.69	2.44	22.72	298.73
	SD ±	9.57	12.88	10.46	176.25	1.78	235.01	255.43	1.40	135.58	0.22	0.38	2.00	56.34
2	Mean	102.39	55.59	266.71	1972	7.24	1208.90	1843.18	20.21	816.46	2.46	2.19	25.12	298.68
	SD ±	8.27	16.81	29.93	229.13	1.42	148.17	207.50	6.07	206.63	0.50	0.63	7.67	35.05
3	Mean	116.00	74.03	332.17	2440	8.34	1802.48	2212.46	22.93	809.94	6.28	2.40	23.19	325.29
	SD ±	7.21	10.68	10.37	82.66	1.54	241.94	292.99	5.75	221.27	1.73	0.53	5.98	52.77
4	Mean	101.39	65.21	280.31	2110	5.17	1435.05	1833.94	18.99	1758.46	5.46	2.33	19.71	370.84
	SD ±	5.05	10.99	15.54	144.11	1.61	211.24	289.28	6.23	232.21	0.42	0.65	5.70	37.80
	Mean	109.91	69.40	310.00	2296	7.24	1429.77	1973.32	20.35	1064.59	4.22	2.34	22.68	323.38
	SD ±	7.53	12.84	16.57	158.04	1.47	209.09	261.30	4.86	198.92	0.72	0.55	5.34	45.49
	%	195.39	166.55	137.77	153.03	24.14	178.72	246.67	203.49	106.46	281.42	137.55	119.39	538.97
	RDA	*	*	*	*									

\*% requested

#Nutrients were computed according to Food Composition Table for use in the Middle East [6]

nutrient shortages. Fiber content of the meal should be carefully looked at. Hence, regarding the availability of calories and nutrients on patient's tray it was clear that the meals served were sufficient to provide the recommended dietary allowance. However, edible plate waste should also be considered if malnutrition of hospitalized patients was evident. We have to look for reducing edible plate waste and adhere to the MOH manual for proper cost effective running of the hospital food service. To achieve this, many related factors should be studied and the important ones should be considered. It was also clear that Middle East Food Composition Tables could be used in the absence of the Saudi Food Composition Tables.

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## محتوى الطاقة والعناصر الغذائية للوجبات العادية وحميات مرضى السكر والتغذية المعوية المقدمة في أربعة من مستشفيات وزارة الصحة في مدينة الرياض

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**ملخص البحث.** تمت دراسة وتحليل مكونات الوجبة العادية وحمية مرضى السكر والتغذية المعوية في أربع عشرة من مستشفيات وزارة الصحة في مدينة الرياض من حيث المحتوى الطاقي والعناصر الغذائية. تركزت الدراسة على تحديد المحتوى الفعلي من هذه العناصر في صينية طعام المريض. ولقد أستخدم التحليل المخبري المباشر وطريقة الحساب من جداول تحليل الأغذية لتحديد مكونات هذه الوجبات.

أظهرت النتائج بوضوح أن ما تم نشره عالمياً من أن أكثر من ٣٥% من المرضى المنومين في المستشفيات مصابون بسوء التغذية، إن صحت هذه المقولة في المملكة، يمكن أن يفسر بأسباب أو عوامل أخرى غير توفر أو نقص العناصر الغذائية في صينية المريض في حالة المملكة. تم تقييم الوجبات على حسب احتياجات المريض ووضعت بعض التوصيات التطويرية وأهمها الالتزام بالوثيقة العامة للتغذية (وزارة الصحة) والاهتمام على وجه الخصوص بحميات مرضى السكر والتغذية المعوية ومعالجة النقص في محتوى الألياف لبعض الوجبات.