

Proximate Composition and Cholesterol and Mineral Content of Saudi Arabian “Kabsah”

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Abstract. Samples of Saudi Arabian “kabsah” were randomly collected from 15 commercial kitchens “matbakh” in Riyadh and analyzed for proximate composition, cholesterol, and mineral content. Average proximate composition was; 62.06% moisture, 1.31% ash, 3.56% fat and 3.35% protein, on fresh weight basis. Average mineral content in mg/100 g sample was; 50.70 potassium, 240.41 sodium, 5.35 calcium, 11.12 magnesium, 0.08 manganese, 0.5 iron, 0.27 zinc, 0.28 lead, and 0.11 copper. Cholesterol content was unexpectedly very low in most of the samples analyzed and averaged 2.97 mg/100 g of kabsah.

Introduction

Amongst all Saudi Arabian dishes, “kabsah” remains the most popular and frequently consumed item both in the household kitchens as well as at commercial establishments catering to social functions, viz., marriages and other celebrations. It is mainly made out of rice cooked with either lamb, chicken, beef or camel meat. The other ingredients include onions, tomatoes, salt and spices cooked in either animal fat or vegetable oil [1].

Due to its popularity, “kabsah” is the main dish commercially prepared by catering establishments/companies in the country. In Riyadh Municipality area alone, there are 172 such commercial catering establishments (commonly called matbakh or public kitchens), that serve this elite indigenous dish on special occasions.

Commercial preparation of “kabsah”

The demand for kabsah in the urban areas of the country is very high. A large quantity of kabsah is prepared by the above mentioned catering kitchens every day to meet the consumer demand. Large scale “kabsah” preparation in these places involves three steps. In the first step onions and tomatoes are fried in animal fat or vegetable oil with spices followed by addition of water. Next step involves addition

of at least five whole carcasses of lambs in case of lamb meat kabsah. The carcasses are taken out after they are cooked. The third and final step involves addition of rice which is cooked till done.

As is obvious from the method of its preparation, the final product would be expected to have high animal fat and hence a high cholesterol content. Cholesterol consumed in diet is a major contributor to blood cholesterol level [2]. Hardening of arteries through plaque formation or atherosclerosis is a result of elevated blood cholesterol levels [3]. Even in the nutritionally conscious western world cardiovascular diseases cause at least one third of total deaths each year. Hypercholesterolemia has been identified as among four risk factors of cardiovascular diseases in humans [4] and it has been supported by indirect evidence from animal studies.

Studies of both animal and human subjects have indicated that saturated fatty acids in the diet tend to elevate serum cholesterol while polyunsaturated fatty acids have a lowering effect [2]. A study of Saudi Arabian dishes has shown kabsah to have a higher percentage of saturated fatty acids [5].

Keeping in view the cook-ware used in these kitchens, the heavy metal content was another important factor to study. Generally, large aluminum kettles are used to prepare kabsah in these places. Heavy metals especially lead has long been recognized as poisonous when taken into the body in sufficient quantity. At relatively lower exposure, lead has been shown to cause neurologic impairment with a wide range of severity [6]. While blood levels of general population have been found to vary from 10 $\mu\text{g}/\text{dl}$ to 30 $\mu\text{g}/\text{dl}$, symptoms of lead poisoning have been detected in subjects with blood levels of 70-80 $\mu\text{g}/\text{dl}$ [7]. Since lead occurs as an environmental pollutant from automobile exhausts and industrial sources, people are already exposed to considerable doses of lead through various routes, viz., breathing lead polluted air, water and foods contaminated directly or indirectly [8]. There has been mounting concern over the degree of exposure to lead and health experts have been stressing the need to keep lead ingestion from other sources at its min.

On the contrary, copper is an essential trace element which functions in numerous enzyme systems, is vital in haemoglobin formation, collagen synthesis and melanin production. It is also important in respiratory chain and phospholipid formation. While its deficiency may cause several disorders, its excessive intake causes extensive damage to liver, kidney and central nervous system. Corneal degeneration is another important condition of excess copper in tissues [9, p. 302].

The objectives of this study were: (1) to study general nutrient information and mineral content of commercially prepared "kabsah"; (2) to find out cholesterol, lead and copper concentration of kabsah prepared in these kitchens. This article presents the proximate composition, cholesterol and mineral content of "kabsah".

Materials and Methods

Fifteen commercial kitchens were randomly selected all over Riyadh. A technician observed the method of preparation in detail before he collected the samples of the final product from each kitchen. Samples of the final produce which is rice alone (as described in commercial preparation of "kabsah") were collected and frozen in tight capped plastic containers until analyzed. The analysis was usually done the next day after the collection. All the fifteen samples were analyzed in triplicate for proximate composition, cholesterol and mineral content. Proximate analysis was carried out according to methods described by AOAC [10]. Mineral content was analyzed by wet ashing according to methods of Osborne and Voogt [11]. Sodium and potassium were estimated using Eppendorf 700 flame photometer. Calcium, magnesium, iron, zinc, manganese, copper and lead were determined by atomic absorption spectrophotometer (Instrumentation Laboratories model 251).

Free cholesterol was extracted according to methods described by AOAC [10]. The unsaponified fractions were analyzed for free cholesterol following the method of Kovacs *et al.* [12] with a HP 5840 A gas chromatograph equipped with glass column (2m × 2mm id) and nitrogen as mobile phase.

Results and Discussion

The proximate analysis of all the fifteen samples of kabsah is given in Table 1. Average moisture content of the samples was $62.06 \pm 2.37\%$ while the average ash content was found to be $1.31 \pm 0.25\%$. The fat content of the samples varied from 2.556% to 5.374% with an average of $3.56 \pm 0.75\%$. The average protein content of the fifteen samples of kabsah was found to be $3.35 \pm 0.20\%$. As described in the commercial preparation of "kabsah", the rice is cooked in the soup in which several carcasses of lambs are cooked with added spices, salt, onions and tomatoes. Before adding rice to the kettles, vegetable oil is also added. This might explain the lower moisture content and a much higher fat content of kabsah when compared to values for plain cooked rice [13]. Average protein content of kabsah rice was also found to be 1.5 times higher when compared to plain cooked rice values, obviously because of soluble proteins contributed by meat soup in which the rice was cooked.

The mineral composition of the kabsah samples is given in Table 2. Average potassium, sodium and calcium content of fifteen samples analyzed were 50.69 ± 13.35 , 240.41 ± 111.56 and 5.35 ± 2.52 mg per 100 g wet sample, respectively. When compared to the values for plain cooked rice [13], sodium was found to be lower, while potassium showed a slight increase, and the calcium content was found to be reduced to almost half. This may be attributed to the fact that kabsah, considering its method of preparation and addition of different condiments, spices and vegetables, results in a totally different product with a wide difference in proximate composition

Table 1. Proximate analysis of Saudi Arabian "Kabsah". Percent ash, protein, and fat in "kabsah". (Fresh weight basis)

Sample No.	Moisture %	Ash %	Protein %	Fat %
1	60.46	0.82	3.70	2.88
2	63.59	1.16	3.28	3.58
3	61.88	1.63	3.32	2.56
4	68.70	0.84	3.08	2.54
5	61.93	1.36	3.20	3.81
6	60.78	1.55	3.33	3.00
7	63.16	1.33	3.58	3.26
8	59.21	1.23	3.51	3.83
9	63.07	1.45	3.38	3.84
10	64.02	1.25	3.56	3.66
11	59.06	1.21	3.22	3.45
12	62.13	1.20	2.93	5.37
13	60.13	1.45	3.30	3.49
14	60.95	1.70	3.37	3.30
15	61.88	1.51	3.43	4.76
Mean \pm SD	62.06 \pm 2.37	1.31 \pm 0.25	3.35 \pm 0.20	3.56 \pm 0.75

and mineral content when compared to plain cooked rice. Magnesium, manganese and iron averaged 11.12 ± 5.31 , 0.08 ± 0.05 , and 0.50 ± 0.17 mg/100 g wet sample. Average zinc content was found to be 0.27 ± 0.11 mg/100 g wet sample.

Average lead content (Table 3) was 0.28 ± 0.22 mg per 100 g of wet kabsah. It may be assumed that if a person consumed 400 g or more of this dish, the amount of lead ingested would exceed 1 mg. It also reflects good quality cook-ware used in commercial kitchens. Considering the fact that lead intake from other food sources and environment is high enough, any further intake would presumably, exceed the recommended safe levels of the toxic element. Evidence indicates that if ingestion of lead from all sources exceeds 0.4 to 0.5 mg per day for one year or more, there will be accumulation of lead in the body in small amounts [8].

Copper (Table 3) averaged 0.11 ± 0.03 mg per 100 g wet sample. Estimated safe and adequate daily intake of copper for adults as prescribed by U.S. recommended daily allowance is 2.0 to 3.0 mg. Looking at copper content of kabsah in this study, it may be assumed that copper not only falls in a safe range but also leaves ample room for intake from other sources as well.

Table 2. Mineral content of Kabsah (mg/100 g wet sample)

Sample No.	K	Na	Ca	Mg	Mn	Zn	Fe
1	35.45	111.25	3.16	16.25	0.13	0.38	0.40
2	51.00	395.10	5.93	5.94	0.07	0.07	0.38
3	68.33	216.66	4.33	12.40	0.03	0.32	1.00
4	27.10	107.35	2.13	7.60	0.14	0.24	0.39
5	51.30	409.30	7.39	5.73	0.09	0.14	0.38
6	54.17	228.33	2.83	10.40	0.03	0.35	0.65
7	42.20	140.35	3.98	25.50	0.20	0.45	0.47
8	83.40	335.20	12.02	7.80	0.12	0.33	0.57
9	43.33	198.33	4.83	9.73	0.03	0.33	0.58
10	42.45	138.55	4.42	14.35	0.14	0.29	0.26
11	46.50	354.10	6.90	6.90	0.08	0.11	0.38
12	47.50	148.33	5.00	9.90	0.03	0.30	0.53
13	58.50	418.30	8.29	6.85	0.10	0.14	0.39
14	55.00	228.33	5.33	16.57	0.03	0.30	0.47
15	54.17	191.66	3.66	10.90	0.03	0.27	0.58
Mean	50.69	240.41	5.35	11.12	0.08	0.27	0.50
±SD	±13.35	±111.56	±2.52	±5.31	±0.05	±0.11	±0.17

Table 3. Cholesterol, lead and copper content of "kabsah" (mg/100 g wet sample)

Sample No.	Pb	Cu	Cholesterol
1	0.59	0.10	4.00
2	0.08	0.08	0.40
3	0.13	0.15	1.00
4	0.68	0.12	3.20
5	0.08	0.08	5.50
6	0.12	0.08	2.88
7	0.20	0.10	—
8	0.16	0.11	4.60
9	0.13	0.13	0.64
10	0.66	0.10	4.56
11	0.15	0.08	1.54
12	0.17	0.16	3.00
13	0.08	0.08	2.40
14	0.32	0.18	—
15	0.22	0.11	4.88
Mean ±SD	0.28±0.22	0.11±0.03	2.97±1.7

The most unexpected finding was that of cholesterol content (Table 3). The average cholesterol content was 2.97 ± 1.70 mg per 100 g sample of kabsah. It was expected that cholesterol would be much higher keeping in mind that the rice is cooked in the same vats in which usually five whole lambs are cooked. Amount of fat from the lambs would naturally be very high. This low cholesterol content may be attributed to the practice of the commercial cooks who skim off the top layers of fat in the vats after they remove the lambs from them. The fact was not known before. The removal of top fat layers from vats is followed by addition of vegetable oil before the addition of rice for cooking. This may also explain the reason for a vast range of variation in cholesterol content of the samples. Since the degree of skimming and addition of vegetable oil may vary from one cook to another, the cholesterol content might vary accordingly.

In an earlier study [5], home-made kabsah was shown to contain 8.2 mg cholesterol per 100 g sample which is much higher than found in most of the samples in this study. It may be assumed that the skimming of top fat layers has a remarkable effect of lowering cholesterol content in the final product. It would be advisable to have the top layers of fat removed properly. It may even be advisable for the public health authorities to enforce the practice of removal of top layers of fat and addition of vegetable oil to obtain a healthier product. At the same time it can be safely assumed that frequent consumption of kabsah from commercial kitchens should not pose any threat to health in light of findings of this study.

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المكونات الرئيسية والمحتوى من الكولسترول والمعادن للكبسلة السعودية

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ملخص البحث . أخذت عينات من «الكبسلة» السعودية عشوائياً من خمسة عشر مطبخاً شعبيّاً في مدينة الرياض، وحللت إلى مكوناتها الرئيسية ومحتواها من الكولسترول والمعادن . وكان معدل المكونات الرئيسية كالتالي: رطوبة ٦٢,٠٦٪، رماد ١,٣٪، دهون ٣,٥٦٪، بروتين ٣,٣٥٪. أما متوسط المحتوى من المعادن فكان كالتالي: ٥٠,٧٠ ملجم بوتاسيوم، ٢٤٠,٤١ ملجم صوديوم، ٥,٣٥ ملجم كالسيوم، ١١,١٢ ملجم ماغنسيوم ٠,٥٠ ملجم حديد، ٠,٢٧ ملجم زنك، ٠,٢٨ ملجم رصاص، ٠,٢٢ ملجم نحاس وذلك لكل ١٠٠ جم من العينة . وعلى عكس ما كان متوقّعا كانت كمية الكولسترول منخفضة في بعض العينات، وقد بلغ متوسط كمية الكولسترول ٢,٩٦ ملجم / ١٠٠ جم من العينة .