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East-Greenland traditional nutrition: a reanalysis of the Høygaard *et al.* nutritional data (1936–1937)

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Abstract

Greenlandic traditional nutrition was unique in the arctic environment. The aim of the present study was to reanalyse the Høygaard *et al.* data, focusing on two micronutrients object of discussion, i.e. Ca and vitamin C. Høygaard *et al.* left Copenhagen in August 1936 and stayed in East-Greenland until August 1937. The members of the expedition recorded nutritional intake whilst residing in families. However, the nutritional intake was analysed on a household level. In total, thirty-five adults and fourty-one children participated. Median total energy expenditure in kcal per d was estimated at 2978 and 2627 for male and female adults, respectively, and 1997 for children and adolescents. Median (IQR) energy consumption in kcal per d was 3881 (1568) for male and 2910 (882) for female adults. This was 2442 (857) and 2023 (1122) for male and female children and adolescents. Median (IQR) Ca intake in mg.d^{-1} was 555 (1110) for male and 484 (883) for female adults. This was 458 (747) and 358 (838) for male and female children and adolescents. Median (IQR) vitamin C intake in mg.d^{-1} was 79 (77) for male and 59 (56) for female adults. This was 44 (47) and 60 (52) for male and female children and adolescents. In this study, the importance of traditional foods in reaching an acceptable energy balance was emphasised, together with the confirmation of a low Ca intake in East-Greenland traditional dietary pattern, and the important role of algae consumption in Inuit traditional dietary pattern to avoid scurvy.

Key words: Traditional nutrition: Inuit: Greenland: Calcium: Vitamin C

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The world globalisation creates a more uniform nutritional pattern, englobing local cultures and traditional dietary patterns. Nutritional ethnography, the science behind the interactions between humans and environment, has an essential role to play in describing traditional dietary patterns[1]. Nutritional ethnography implicates not only work in the field but also a (re)analysis and standardised reporting of historical nutritional data.

Inuit traditional nutrition was unique because the nutritional resources of the environment were limited and the almost non-existent agriculture due to weather conditions[2]. As stated by Kuhnlein *et al.*[3], who studied Canadian Inuit nutrition, the traditional dietary pattern played a central role in the cultural identity. The traditional dietary pattern changed slowly to more Western dietary patterns, associated with an increase in chronic diseases such as obesity, diabetes and CVD[4].

In Inuit traditional nutrition, two micronutrients were subject of intense discussions and controversy in the past, i.e. Ca and vitamin C. Ca is a mineral for optimal bone and teeth health and plays a critical role in nerve and muscle function[5,6]. The Inuit traditional dietary pattern has been described as low in Ca, mainly because marine food is a poor source of Ca[7]. When excluding famine, scurvy, a disease due to a low vitamin C intake, is probably the nutritional deficiency disease that has caused the highest mortality in human history[8]. The arctic environment, with long winters and an almost total lack of fresh vegetable foods, was challenging to avoid scurvy. Questions arise about the sources of vitamin C in the Inuit traditional food system[8].

An important barrier in reanalysing traditional nutrition is that nutrition is often recorded anecdotally by early explorers and researchers. This was not the case for the Høygaard *et al.* expedition[9]. Høygaard *et al.* left Copenhagen in August 1936 and stayed in East-Greenland until August 1937. The nutritional data were recorded by two researchers, but analysed on a household level only. Luckily, Høygaard *et al.* published the raw data as supplement, allowing a reanalysis on individual basis[9].

The aim of the present study was to reanalyse the Høygaard *et al.* nutritional data. In previous publications, we focused on adults, and some data for adults in Table 3 have been reported in the International Journal of Circumpolar Health[10,11]. In this publication, we focus on Ca and vitamin C in daily nutritional

Abbreviation: IQR, interquartile range.

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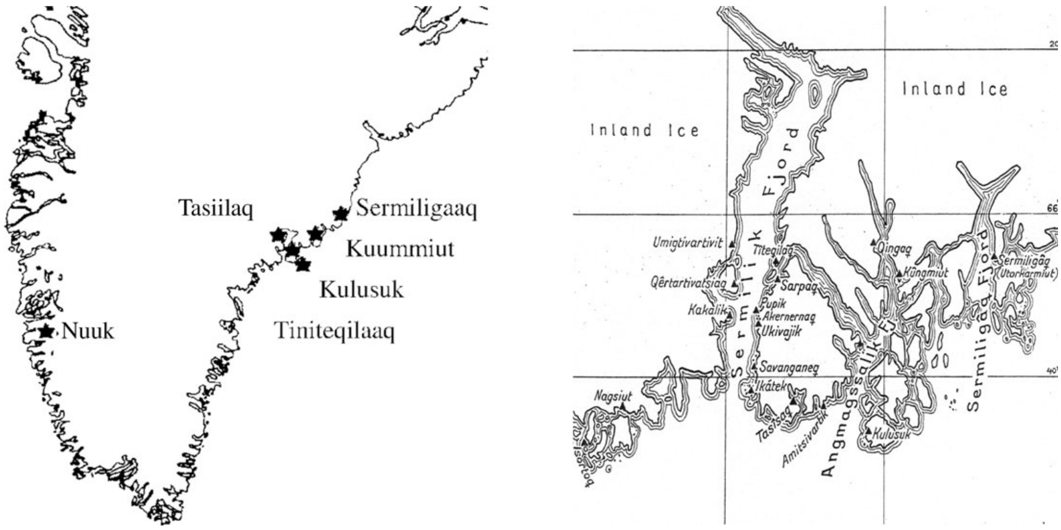

Fig. 1. Locations in East-Greenland of the Høygaard *et al.* study 1936–1937.

patterns of adults and children in a mid-1930 Inuit settlement in East-Greenland.

Methods

Participants

In 1937, the old 'Angmagssalik' district counted 756 inhabitants living in seventy-three houses (Fig. 1). Høygaard *et al.* selected ninety participants for the study, but for this analysis, we excluded fourteen participants less than two years old (nine boys and five girls). According to Høygaard *et al.*, infants were suckled until they were two years old. In total, seventy-six participants clustered in thirteen families were selected: four individuals from Amituarsuk, twelve from Ikateq, ten from Kulusuk, twelve from Qernertivartivit, seventeen from Sermiligaq and fifteen from Titeqilaq; six participants lived near trading centres, three from Igdlumuit and three from Tasisaq (trading centre). Participating families were offered one krone per family.

Assessment of nutrition

At baseline of the Høygaard *et al.* study, two researchers living with the families weighed all the imported and traditional foods in the houses. During the study, all given or received foods were registered, together with the blubber quantities used for the lamps, the dog food and the food supply stored. At endpoint, food quantities in the houses were weighed again. Høygaard *et al.* stated that they tried to limit interference of the researchers to induce the participants to other food than usually consumed. Food was weighed in a raw state. After cooking the remnants, mainly bones were weighed again, and the weight was subtracted from the total weight before cooking.

The total number of days that food was recorded varied between 6 and 225 per family. To estimate individual food consumption in this study from the Høygaard *et al.* data, the adult-equivalent conversion factors were used from Claro *et al.*[12] (online Supplementary Table 1S). A total adult-equivalent conversion factor for a whole family was estimated from the Claro *et al.* data, for example, for a family of one male adult of 43 years and one male adult of 18 years, this was 1·1 plus 1·2 = 2·3. The total food consumption of the family was divided by the total conversion factor, and the individual consumption was calculated by multiplying this by the individual conversion factor. Total traditional and imported food estimates from households were divided by adult-equivalents[9].

Estimation of the nutritional composition of traditional foods

To estimate the nutritional composition of traditional food, Høygaard *et al.* dissected fjord seals, cods, guillemot and ducks. Meat, organs and blubber were weighed and analysed for composition (online Supplementary Table 2S). The composition of imported food was calculated using McCance and Widdowson's Composition of Foods[13]. Høygaard *et al.* determined vitamin C in traditional foods by the method suggested by Emmerie and van Eekelen[14]. This method involves titration with 2–6 dichlorophenolindophenol after precipitation of cysteine, glutathione and ergothionine with mercuric acetate[14].

Body weight and height

For adults, body weight and height were measured by the Høygaard *et al.* team between September and October 1936. In absence of BMI data in the Høygaard *et al.* study, we calculated BMI for adults of 18 years or more, using the following formula: BMI = body weight (kg)/height (m)^2. As for children data on weight and height were lacking, we used the standard weight and height for each age from the FAO Standards in Table 1[15].

Assessment of rest metabolic rate, dietary-induced thermogenesis and physical activity

To estimate the rest metabolic rate in kcal per d, we used the Harris–Benedict equation adapted in 1984 for adults and the standard rest metabolism for each age from the FAO

Table 1. Baseline characteristics of the seventy-six participants (Høygaard *et al.* Study 1936–1937)

	Males (*n* 37; 48·7 %)				Females (*n* 39; 51·3 %)			
	≤ 18 years (*n* 16; 43·2 %)		> 18 years (*n* 21; 56·8 %)		≤ 18 years (*n* 25; 64·1 %)		> 18 years (*n* 14; 35·9 %)	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Age (years)	9·5	7·0	35·0	15·0	9·0	7·0	28·5	9·0
Height (cm)	114·6	26·1	161·8	2·1	114·0	23·5	156·4	3·2
Weight (kg)	23·8	11·7	64·9	1·5	23·4	12·0	61·5	4·3
BMI (kg/m^2)			24·9	1·0			25·1	2·9
Number of days food records	*n*	%	*n*	%	*n*	%	*n*	%
From 1 to 10 d	5	31·3	13	61·9	11	44·0	7	50·0
From 11 to 20 d	9	56·2	7	33·3	10	40·0	7	50·0
More than 20 d	2	12·5	1	4·8	4	16·0	0	0·0
Living place in East-Greenland	*n*	%	*n*	%	*n*	%	*n*	%
Amituarsuk	0	0·0	1	4·8	1	4·0	2	14·3
Ikateq	3	18·8	2	9·5	7	28·0	0	0·0
Kulusuk	3	18·8	2	9·5	3	12·0	2	14·3
Qernertivartivit	2	12·5	3	14·3	5	20·0	2	14·3
Sermiligaq	3	18·8	6	28·6	5	20·0	3	21·4
Titeqilaq	4	25·0	4	19·0	4	16·0	3	21·4
Igdlumiut (trading station)	0	0·0	2	9·5	0	0·0	1	7·1
Tasisaq (trading station)	1	6·3	1	4·8	0	0·0	1	7·1

IQR, interquartile range.

Standards for children[15,16]. Dietary-induced thermogenesis was estimated at 10 % of the rest metabolic rate in kcal per d. Physical activity was evaluated as a high physical activity level, following the data of Høygaard *et al*. For males, the researchers observed 8 h of sleep, 12 h of low-intensity physical activity and 4 h of moderate-to-vigorous intensity physical activity during hunting; for females this was 10 h of sleep, 8 h of low physical activity and 6 h of more intense physical activity during household activities and cooking. Physical activity level was evaluated as 2·10 for males and 1·82 for females[17].

Assessment of total energy expenditure

Total energy expenditure expressed in kcal per d was the sum of:

TEE = RM + RM/10 + EE
TEE = total energy expenditure in kcal per d,
RM = rest metabolic rate in kcal per d,
RM/10 = dietary-induced thermogenesis in kcal per d,
EE = energy expenditure by physical activity in kcal per d.
Energy balance (EB) was calculated by: EB = EI – TEE.
EI = energy intake by food and beverages.

Statistics

All descriptive data are presented as median and interquartile range (IQR) because data were not normally distributed. The data were analysed using IBM SPSS Statistics for Windows Version 27.0 (IBM Corp). All data were converted to 24 h, expressed as d^{-1} (day).

Results

Table 1 presents the general characteristics of the 37 (48·7 %) males and 39 (51·3 %) females of the Høygaard *et al.* study. Median (IQR) age in years was 35·0 (15·0) for male and 28·5 (9·0) for female adults. This was 9·5 (7·0) and 9·0 (7·0) for male and female children and adolescents, respectively. Median (IQR) BMI in kg/m^2 was 24·9 (1·0) for male and 25·1 (2·9) for female adults.

Table 2 presents the energy expenditures for the seventy-six participants in the Høygaard *et al.* study. Median (IQR) rest metabolic rate in kcal per d was estimated at 1551 (104) for male and 1368 (25) for female adults. This was 1040 (265) and 1040 (243) for male and female children and adolescents, respectively. Median total energy expenditure in kcal per d was estimated at 2978 and 2627 for male and female adults and 1997 for children and adolescents.

Supplementary Table 2S estimates the nutritional composition of traditional foods. Energy content varied between 20·3 kcal for sorrel and 891·0 kcal for liveroil. Highest protein content was found in dried animal foods, and, as expected, carbohydrate content in animal foods was usually <1 mg for 100 g of food.

Table 3 presents the energy and the macronutrient consumption for the seventy-six participants in the Høygaard *et al.* study. Median (IQR) energy consumption in kcal per d was 3881 (1568) for male and 2910 (882) for female adults. This was 2442 (857) and 2023 (1122) for male and female children and adolescents, respectively. In energy-percent, 38 % were proteins, 39 % fats and 23 % carbohydrates. Less than 3 % of the energy intake came from imported foods.

Table 4 presents Ca and vitamin C intake. Median (IQR) Ca intake in mg.d^{-1} was 555 (1110) for male and 484 (883) for female adults. This was 458 (747) and 358 (838) for male and female children and adolescents, respectively. The Ca content of traditional foods varied between 3 mg for blubber to 1505 mg for dried capelin (online Supplementary Table 2S). In general, the Ca content of animal food is much lower than

Table 2. Energy expenditure of the seventy-six participants (Høygaard et al. Study 1936–1937)

	Males				Females			
	≤ 18 years		> 18 years		≤ 18 years		> 18 years	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Rest metabolic rate (kcal per d)*	1040	265	1551	104	1040	243	1368	25
Dietary-induced thermogenesis (kcal per d)†	104	27	155	10	104	24	137	3
Energy expenditure by physical activity (kcal per d)‡	853	217	1272	85	853	199	1121	24
Total energy expenditure (kcal per d)§	1997	509	2978	199	1997	466	2627	49

IQR, interquartile range.
* Rest metabolic rate estimated by FAO for ≤ 18 years and by Harris-Benedict 1984 for > 18 years (see Method section) (kcal per d).
† Dietary-induced thermogenesis estimated as 10 % of rest metabolic rate (kcal per d).
‡ Energy expenditure by physical activity estimated from the Høygaard data (kcal per d) with a physical activity level of 2·10 for males and 1·82 for females, corresponding to moderate to high physical activity level (see Methods section).
§ Total energy expenditure (kcal per d) (= sum of rest metabolic rate + dietary-induced thermogenesis + energy expenditure by physical activity).

Table 3. Median (IQR) energy consumption and sources of consumption for the seventy-six participants* (Høygaard *et al.* Study 1936–1937)

	Males				Females			
	≤ 18 years		> 18 years		≤ 18 years		> 18 years	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Total energy consumption (kcal per d)	2442	857	3881	1568	2023	1122	2910	882
From animal	2396	886	3751	1456	1983	984	2829	738
From plant	65	77	131	149	99	105	99	108
From traditional	2110	772	3685	1341	1945	954	2720	748
From imported	68	321	88	513	66	303	149	387
Total energy consumption (kcal per d) (*n* 70 – without 6 individuals living near trading centres)	2417	778	3457	1498	2023	1122	2891	723
From animal	2336	844	3403	1470	1983	984	2829	682
From plant	75	78	131	132	99	105	99	99
From traditional	2069	810	3260	1403	1945	954	2659	868
From imported	60	230	0	346	66	303	66	320
Total protein consumption (kcal per d)	862	326	1480	694	922	526	1120	350
From animal	857	326	1473	696	918	520	1116	360
From plant	4	4	7	11	4	6	5	8
From traditional	857	334	1480	676	922	516	1117	330
From imported	5	13	6	28	5	11	8	21
Total fat consumption (kcal per d)	986	584	1281	772	841	284	1002	436
From animal	979	577	1244	831	837	283	1002	453
From plant	4	115	6	45	4	9	5	34
From traditional	954	569	1190	774	806	283	945	433
From imported	4	6	5	7	3	4	4	34
Total carbohydrate consumption (kcal per d)	257	421	383	1324	289	255	415	997
From animal	209	447	271	1207	204	300	369	885
From plant	40	64	75	153	57	103	57	99
From traditional	253	196	383	849	235	103	309	640
From imported	58	235	75	480	56	184	132	362

* All data were extracted from the Høygaard manuscript (see Method section).

the cA content of marine plants. In total 19 % of the male and 43 % of the female adults had a Ca consumption below 400 mg.d^{-1}. This was 38 % and 56 % for male and female children and adolescents.

Median (IQR) vitamin C intake in mg.d^{-1} was 79 (77) for male and 59 (56) for female adults (Table 4). This was 44 (47) and 60 (52) for male and female children and adolescents, respectively. Approximately 40 to 50 % of the vitamin C came from animal foods, where Høygaard *et al.* found a 50 % loss when cooked. Narwhal skin and eyes had a marginal contribution to the vitamin C consumption, in contrast with algae. For males, 5 to 6 % of the participants had a vitamin C intake below 25 mg.d^{-1}, this was 14 to 16 % of the females. Supplementary Table 2S presents the vitamin C content in mg per 100 g traditional Inuit foods as determined by Høygaard *et al.* The vitamin C content varied between 0 mg for blubber and 127 mg for adrenal glands. In general, the vitamin C content of meat is much lower than in organs: seals meat, for example, contains only 2 mg per 100 g compared with 10 to 20 mg for organs. High vitamin C concentrations can be found in some marine plants like Alaria pylaii with 44 mg for 100 g. Fjord seal eye and muktuk or mattak, traditionally seen as rich in vitamin C and antiscorbutic, contain 10 and 20 mg vitamin C for 100 g, respectively.

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Table 4. Median (IQR) calcium and vitamin C consumption and sources of consumption for the 76 participants (Høygaard et al. Study 1936–1937)

	Males				Females			
	≤ 18 year		> 18 year		≤ 18 year		> 18 year	
	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Total Ca consumption (mg.d^{-1})	458	747	555	1110	358	838	484	883
From animal	350	775	409	1238	256	808	256	978
From plant	77	63	135	259	84	111	102	192
From traditional	456	746	555	1109	358	839	484	882
From imported	1	6	2	8	1	5	3	6
From algae	68	52	81	222	66	96	71	168
From dried capelin	218	741	176	1120	126	768	101	897
	n	%	*n*	%	*n*	%	*n*	%
Consumption between 0 and 400 mg.d^{-1}	6	38	4	19	14	56	6	43
Consumption between 401 and 800 mg.d^{-1}	5	31	9	42	3	8	3	21
Consumption more than 801 mg.d^{-1}	5	31	8	39	8	36	5	36
Total vitamin C consumption (mg.d^{-1})	44	47	79	77	60	52	59	56
From animals*	24	9	36	32	23	16	30	14
From plant	21	24	37	73	29	45	28	60
From traditional	44	47	79	77	60	52	59	56
From imported	0	0	0	0	0	0	0	0
From algae	16	14	21	57	18	28	19	43
From narwhal skin (muktuk or mattak†)	0	13	0	27	0	0	0	3
From seals eyes	0	0	0	0	0	0	0	0
	n	%	*n*	%	*n*	%	*n*	%
Consumption between 0 and 25 mg.d^{-1}	1	6	1	5	4	16	2	14
Consumption between 26 and 50 mg.d^{-1}	8	50	4	19	7	28	5	36
Consumption more than 51 mg.d^{-1}	7	44	16	76	14	56	7	50

* All data were extracted from the Høygaard manuscript (see Method section). Høygaard *et al.* found a mean of 50 % loss when cooking.
† Muktuk or mattak was two or three days old when vitamin C was determined.

Figure 2 presents the individual vitamin C consumption in mg.d^{-1} *v.* total algae consumption in g.d^{-1}. An increase in algae consumption was clearly associated with an increase in vitamin C consumption ($r^2 = 0{\cdot}78$). Six persons living near trading centres and consuming more imported foods had the lowest daily vitamin C consumption, increasing the risk of developing scurvy (marked in red in Fig. 2).

Discussion

The main findings from the reanalysis of the Høygaard *et al.* data are that the food consumed in East-Greenland came mainly from traditional hunting and was low in carbohydrates. Second, Inuit traditional dietary pattern was low in Ca, and sources of Ca were algae and dried fish. Third, we emphasise the role of algae consumption in East-Greenland traditional dietary pattern as source of vitamin C. Food traditionally seen as sources of vitamin C like eyes from seals and narwhal skin played probably a minor role in avoiding scurvy.

The mean Ca intake in the Høygaard *et al.* study, i.e. 294 mg per 1000 kcal for males and 358 mg per 1000 kcal for females, was higher as described by Deutch *et al.* in 1953[18]. They found a mean intake of 235 mg per 1000 kcal for Qaqortoq and 221 mg per 1000 kcal for Ilulissat. In the Høygaard *et al.* data, more than 95 % of foods were traditional, which was much lower in Deutch *et al.*, i.e. 17 % for Qaqortoq and 25 % for Ilulissat. However, and for both studies, the intake of Ca was far below the recommendations of the Nordic Nutrition Recommendations 2012, i.e. 800 mg per d[19].

As noted by Høygaard et al., an often forgotten Ca source is drinking water. The geological systems south of Scoresby Sound are poor in Ca, so fresh water contains maximally 200 mg per l. However, at one liter water a day, this could be a non-negligible source of Ca with a biological availability comparable to milk[20]. We have no data in Høygaard et al. to know if the low Ca intake was associated with health problems, except the statement that the team did not observe osteomalacia, a disease caused by inadequate levels of Ca and/or vitamin D. Sellers *et al.* gave ten healthy Inuit children (5 to 17 years of age) a standardised Ca load[21]. Dietary Ca absorption appeared to be more efficient in these Inuit children, with an increased frequency of hypercalciuria. The authors stated that a genetic adaptation to low Ca dietary patterns may be present in Inuit, with a possible risk of nephrolithiasis if standard nutritional guidelines would be followed.

A high vitamin C content of algae was confirmed by Emmerie *et al.* in 1933. They found 43 mg vitamin C in *Fucus serratus* and even 77 mg vitamin C in *Fucus vesiculosis*[14]. According to Hoygaard *et al.*, algae were much more consumed between September and December and plant foods during the rest of the year[9]. Mattak or muktuk was seen by early researchers as an important source of vitamin C, but the consumption was very low and depending on the hunt. Second, seals eyes were also seen as source of vitamin C, but an eye, usually consumed raw, weighted only 33 g, which is 3 mg vitamin C, too low to feed a community[9]. A person would need three eyes a day to reach 10 mg vitamin C and avoid scurvy, which represents 1·5 seal a day! Data on the prevalence of scurvy in East-Greenland in

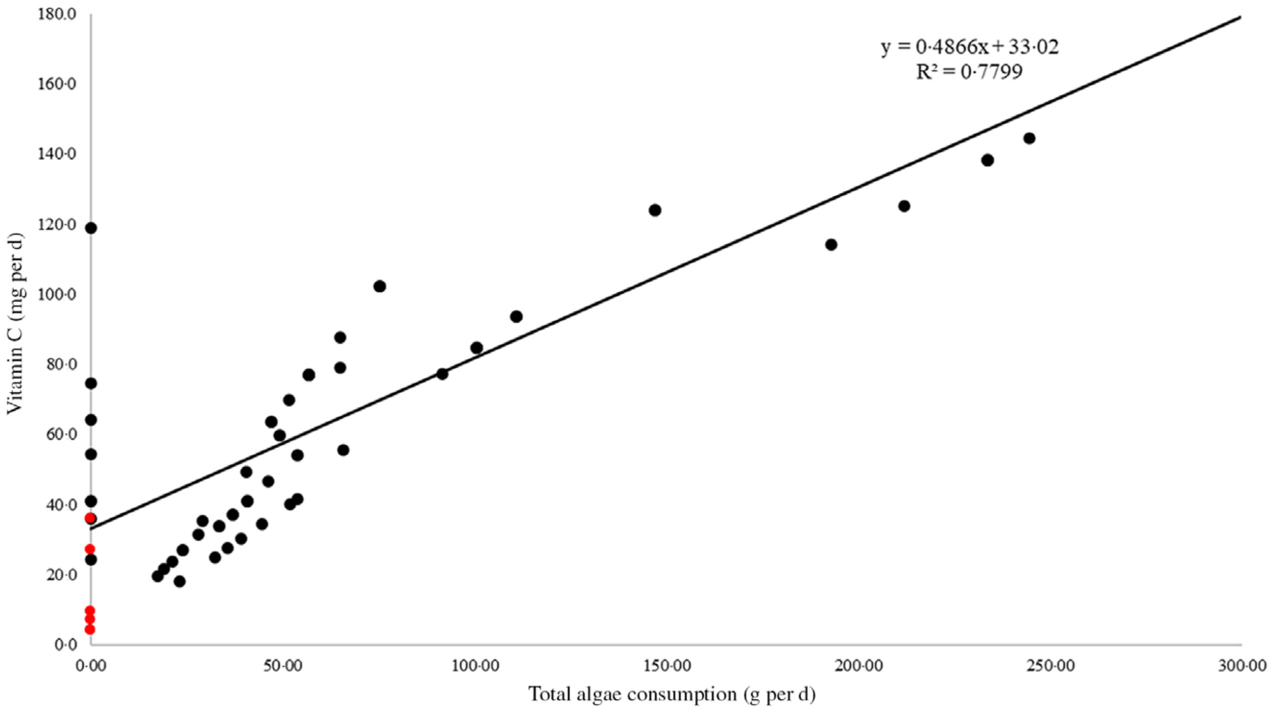

Fig. 2. Vitamin C consumption (mg per d) *v.* total algae consumption (g per d) for the seventy-six participants (Høygaard Study 1936–1937).

1936–1937 are lacking. According to Høygaard *et al.*, severe scurvy was unknown in the area under study, but sub-scurvy cannot be excluded in view of the chronic gingivitis observed by Høygaard *et al.* during spring. Høygaard *et al.* performed thirty-four blood determinations of vitamin C, 18 between November and April, and 16 between July and August. In total, 12 (35 %) observations were between 0·5 and 1·2 mg per dl, 16 (47 %) around 0·4 mg per dl and 6 (18 %) <0·3 mg per dl. The reported vitamin C blood determinations reflect hypovitaminosis C for 47 % of the sample and scurvy levels for 18 % of the population. It is remarkable that all six with extreme low blood concentrations of vitamin C lived near the trading centre consuming more imported food and less traditional food. Of the six persons living near trading centres, three adults lived in Igdlumuit and two adults with one child in Tasisaq. This distribution into two distinct families limits the possibility of a family clustering effect and/or of a genetic efficacy in vitamin C metabolisation[22].

Høygaard *et al.* noticed high seasonal variations in body weight, probably as consequence of variations in energy balances. Høygaard *et al.* recorded adult body weight of ten male and eight female Inuit. The highest mean weight for males was in September 1936 with 64·7 kg, the lowest in April 1937 with 61·6 kg, a difference of 3·1 kg or 21 700 kcal in approximately 212 d or 100 kcal per d. For females this was 63·3 kg in April 1937 and 55·0 kg in July 1937, a difference of 8·3 kg or 58 100 kcal in 122 d or 476 kcal per d, assuming no pregnancy. Høygaard *et al.* recorded a mean height for male adults of 1·61 m and 1·53 m for female adults. This means that the seasonal BMI (in kg/m^2) varies between 23·8 and 25·0 for male and between 23·5 and 27·0 for female adults. According to the WHO, the same international cut-offs for BMI can be used for Asian populations, meaning that there was no undernutrition in this population during the time of the Høygaard *et al.* study[23]. The different relationship in body weight between season and gender, i.e. a higher body weight for males and a lower body weight for females in the summer, might be the consequence of more hunting opportunities for males in the summer and consuming immediately meat and fat when carving up the game.

The most important limitation of the present study is that converting household consumption to individual consumption will obscure differences in intake among people of differing age and body weight. An unavoidable source of error for Høygaard *et al.* was eating when hunting. It was impossible to prevent the members of a family to hunt and/or to forbid eating during a successful hunting with colleagues. This quantity could not be estimated and will introduce an error mainly on male consumption. A last limitation of the present study is that we do not have information about how representative the sample of 10 % was for the total population in the district. Høygaard *et al.* did not describe how the families were selected, but several families had to be excluded because the nutritional data were unreliable. Again, we have no data about how many families were excluded, and a healthy volunteer effect and Hawthorne effect cannot be excluded.

As conclusion to the present study, a reanalysis of older nutritional data in a modern and standardised way can be interesting to better understand traditional nutritional systems in general, and of East-Greenlandic Inuit in particular. In this study, the importance of traditional foods in reaching an acceptable energy balance is emphasised, together with the confirmation of a low Ca intake in East-Greenland traditional dietary pattern, and the important role of algae consumption in Inuit traditional dietary pattern to avoid scurvy.

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P. M. worked on the original idea for the study. P. M. analysed the data and drafted the first version of the manuscript and corrected by T. D. and P. C. All authors read and approved the final version of the manuscript. All authors had full access to all data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

There are no conflicts of interest.

Supplementary material

For supplementary material/s referred to in this article, please visit https://doi.org/10.1017/S0007114521005055

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