

Diet quality in 116 Norwegian men and women with coronary heart disease

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John Roger Andersen^{1*}, Eva Søgne^{2**}, Gerd Karin Natvig^{3***},

¹Faculty of health studies, Sogn and Fjordane College University/ Section of Nursing Science, Department of Public health Care, University of Bergen., ²Department of Internal Medicine, Førde Central Hospital., ³Section of Nursing Science, Department of Public Health Care, University of Bergen.

*Vie, 6800 Førde, Norway. E-mail: johnra@hisf.no, Telephone: + 47-57722522, Fax: +47-57722501. **6800 Førde, Norway. E-mail: eva.sognen@helse-forde.no, Telephone: +47-57839000, Fax: +47-57839015. ***Kalfarveien 31, 5018 Bergen, Norway.. E-mail: Gerd.Natvig@isf.uib.no, Telephone: +47-55586188, Fax: +47-55586105.

Corresponding author: 1*.

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Abstract

Background and aims

Clinical intervention studies have provided strong evidence that a healthy diet can prevent coronary heart disease. The aims of this study were to describe the diet quality in Norwegian subjects from Sogn and Fjordane County with coronary heart disease, and to investigate if the diet quality was associated with demographic and lifestyle variables.

Methods

We used a self-administered questionnaire to assess information from 116 participants. A Healthy Diet Score (HDS) indicated the diet quality. Multiple Linear regression analyses were used to investigate associations between relevant variables and the HDS.

Results

We found that 26.7% of the participants had a poor HDS, 64.6% had a fair HDS and 8.7% had a good HDS. We found that the widespread suboptimal diet quality (poor or fair HDS) was partially related to low consumption of nonhydrogenated mayonnaise products, vegetables, and fruit/berries/juice. Multiple linear regression analysis showed that women had better HDS than men, and that subjects with high education had better HDS than subjects with low education ($P < 0.05$).

Conclusion

We found that 91.3% of the participants had a suboptimal diet quality. The consumption of nonhydrogenated mayonnaise products, vegetables and fruit/berries/juice were poor and a principal goal should be to increase the consumption of these food items. Health professionals should keep in mind that gender and educational level may be associated with dietary habits. An important clinical implication of this study is that more attention should be paid to dietary counselling.

Keywords: coronary heart disease, diet, diet quality, Norwegian, prevention

Introduction

Clinical intervention studies have provided strong evidence that a diet dominated by fruit, vegetables, whole grains, nuts, fish and nonhydrogenated unsaturated fats can reduce the risk for coronary heart disease (CHD) by 40–70%.^{1–4} The extremely impressive protective effects in these studies occurred within a few weeks of patients receiving dietary counselling and changing their diets.

Despite this evidence, data on the diet quality of subjects with CHD not taking part in such intervention studies are limited. The sparse existing data from Norwegian^{5, 6} and international studies^{7–9} indicates that many subjects with CHD have a suboptimal diet quality. In Sogn and Fjordane County, Western Norway, with 100,000 inhabitants, knowledge about the diet quality of subjects with CHD, has to our knowledge, never been reported. Such knowledge could be useful for health professionals from this area, when planning, performing and evaluating dietary counselling.

Another issue is variation in diet quality between different groups of subjects with CHD. In addition, in this field, the data are limited.¹⁰ Most of the studies examining this have been conducted in healthy men and women. In such studies, strong associations have been found between variables including socioeconomic status, gender, smoking, physical activity and diet quality.^{11–14} However, little is known of associations between heart disease, diet and lifestyle.¹⁰ Such knowledge can be useful in identifying groups than might be at high risk due to poor diet.

The main purpose of this study was therefore to describe the diet quality in patients with CHD in Sogn and Fjordane County, and to investigate associations between diet quality, relevant demographic and lifestyle variables.

Methods

Study design and subjects

The study population was Norwegian men and women from Sogn and Fjordane county, aged 50 to 75 years, hospitalised and diagnosed for CHD (defined by I 20 and I 21 on the ICD-10 International Statistical Classification of Diseases and Related Health Problems) for the first time at Førde Central Hospital, between February 1998 and February 2003. Exclusion criteria were diseases such as cancer or dementia that could severely impact on the dietary habits or the ability to respond to the survey. The inclusion criteria of having received only ordinary care, and not currently participating in any dietary intervention study were met by 190 subjects. As two subjects could not be located, the total number of subjects was 188. In April 2004, all eligible subjects received a letter of invitation and a self-instructive questionnaire by postal mailout. If a subject completed and returned the questionnaire, it was regarded as their agreement to participate in the study. A written reminder was sent out to non-responders about three weeks after the first invitation. This procedure was approved by the ethical committee and was carefully explained in the letter of invitation.

The measures

All data were self-reported, except the CHD diagnosis, which was assessed from the hospital data records.

Assessment of dietary habits

A self-administered 15-item food-frequency questionnaire (SmartDiet™) was applied to assess subjects' average intake of dairy products, mayonnaise products, meat, grain, fish, fruit, vegetables and snacks (Table 1).¹⁵ The questionnaire had three response categories; least healthy (1 point), medium healthy (2 points) and most healthy (3 points). The scores on the 15 questions were summed to obtain a Healthy Diet Score (HDS) ranging from 15 to 45 points. An individual HDS ≥ 38 points indicated good diet quality, a HDS from 30–37 points indicated fair diet quality and a HDS < 30 points indicated poor diet quality. At a group level, a mean score on a single question of < 2.0 points indicated poor adherence to the recommended diet, a score between 2.0 – 2.49 points indicated fair adherence and a mean score ≥ 2.5 points indicated good adherence. The reproducibility and validity studies of the 15-item questionnaire comparing the sum scores and a 7-day weighed food record gave correlation coefficients of respectively 0.95 and 0.73.¹⁵ The correlation between the sum score of the questionnaire and the percentage of dietary saturated fat was -0.59 .

In addition, we collected data on frequency of alcohol consumption (never/less than one time per month, one time per month, two to three times per month, one time per week, two to three times per week or four times or more per week), and use of dietary supplements that contained vitamins/minerals or fish oil (never, occasionally or daily).

Assessment of demographic and lifestyle variables

We collected data on age, gender, height, weight, marital status (married/cohabitation or not married/cohabitation), education (primary school, secondary school, college/university education < five years or \geq five years), personal assessment of current health status (poor, not that good, good or very good), physical activity (also including gardening and light walking; seldom/never, less than one hour per week, one to two hours per week, two to three hours per week or five or more hours per week) and smoking (never, occasionally or daily) and how important the subjects thought that a healthy diet was for preventing CHD (not important, a little important, important or very important). We also asked if they had received any information about diet from the hospital staff or from their personal doctor.

Missing items

Missing items was set as the median or mean of the whole sample. If any respondent had more than two missing items on the dietary questions or more than two missing items on the demographic or lifestyle items, they were excluded from the analysis.

Statistical analysis

For descriptive purposes, means and standard deviations (SD) are given for normally distributed variables, and medians for variables with non-normal distribution. The mean was used to indicate the overall adherence on a group level to the different parts of the recommended dietary regime. Multiple linear regression analysis was used to

examine the association between relevant variables and the HDS. A two tailed p-value of < 0.05 was considered to indicate statistical significance on these tests. To test the differences on scores of individual food items between groups, we used the linear-by-linear association test. The level for significance was then adjusted by the Bonferroni test, meaning that the p-value in the linear-by-linear association tests had to be ≤ 0.002 (two tailed) to be significant. The statistical analysis was performed on a personal computer with the statistical program SPSS for Windows (version 12.0 SPSS Inc., Chicago).

Ethics

The investigation conforms to the principles outlined in the Declaration of Helsinki (Br Med J, 1964;177). The study was approved by The Norwegian Social Science Data Services (NSD) and by the Regional Committee of Ethics in Medicine, Vest-Norway (REK).

Results

Characteristics of the study participants

The characteristics of the 116 study participants are described in Table 2. The response rate was 78 of 188 (41.5%) after the first invitation, and 120 out of 188 (63.8%) after the written reminder. Four responders were excluded due to missing items and the final sample therefore consisted of 116 participants (60.7%). The median age was 66.5 years. The men-women ratio in our sample was approximately similar to the general population in the study area (75% men). A large proportion of the participants were married or cohabitating (84.5%). We found that 58.6% regarded their health as good or

very good. The education level in our sample was low—only 17.2% had College or University education. Obesity ($\text{BMI} \geq 30$) was present in 17.4% of the subjects. Only 15.5% of the sample were regular smokers and 87.9% reported that they had been physically active one hour or more per week. A large proportion of the participants (32.8%) reported that they had never received any dietary advice from a health professional. Regarding the participants' views on how important a healthy diet is for health, 87.1% reported that they thought that a healthy diet was either important or very important.

Diet quality

The HDS distribution is presented in Figure 1. The mean HDS was 32.09 points (SD 3.97). We found that 26.7% of the respondents had a poor HDS (< 30 points), 64.6% had a fair HDS (30–37 points) and 8.7% had a good HDS (≥ 38 points).

The respondents' mean scores on individual food items are presented in Table 1. On a group level, the intake of cream, bread and grains, butter and margarine on bread, fish as a main dish and snacks was good (mean ≥ 2.5). The intake of milk, cheese, meat on bread, fish on bread, meat as a main dish, fatty fish as a main dish and butter and margarine in food preparation was fair (mean 2.0–2.49). The intake of nonhydrogenated mayonnaise products, vegetables, fruit/berries/juice was poor (mean < 2.0).

We found that 70.3% reported that they used fish oil supplements daily or occasionally, and that 41.7% reported that they used vitamin/mineral supplements daily or occasionally. We also found that 50% reported that they drank alcohol less than one time per month.

Quality of diet according to demographic and lifestyle variables

We found that women had better HDS than men (B=2.318, P=0.020), and those with high education had better HDS than those with low education (B=2.271, P=0.003). The R² in the multiple regression model was 0.24. The multiple linear regression analysis is presented in Table 3.

The linear-by-linear association tests indicated that women seemed to have healthier dietary habits compared to men for consumption of meat on bread (P=0.000) and fatty fish as a main dish (P=0.006). Men reported that they drank more often alcohol than women (P=0.000). Furthermore, those with higher education seemed to have healthier habits than those with low education for consumption of grains (P=0.040), meat as a main dish (P=0.017) and fruit/berries/juice (P=0.024). The rest for the analysis is not shown. After Bonferroni adjustment (P≤0.002), only the gender differences for meat on bread and alcohol consumption were statistically significant.

Discussion

This study shows that a large proportion (91.3%) of participants had a suboptimal HDS. The consumption of nonhydrogenated mayonnaise products, vegetables, and fruit/berries/juice were especially low. We also found that 50% of the participants consumed alcohol less than one time per month. Fish oil supplements were consumed by 70.3% and vitamin/mineral supplements by 41.7% of the participants. Finally, we found that gender and educational levels were significantly associated with the HDS.

Our study has some limitations. The relatively small number of total participants

might have lead to Type two errors. Furthermore, the tool we used to assess the dietary habits did not provide information concerning the intake of calories and carbohydrate-rich foods, which are important in relation to overweight and diabetic patients.¹⁵ However this tool has several strengths. It is well validated, fast to fill out, and the HDS and the corresponding diet quality classification are easy to calculate and understand. It is an important point that most dietary assessment tools used in research settings generally are not appropriate for routine clinical use.¹⁵ Because the assessment tool we used in this study is also suitable for clinical practice means that health professionals can use our findings as a reference.

The mean HDS in our study was 32.09 points (SD 3.97), which is almost identical to the mean HDS reported in the validation study for the dietary questionnaire (32.0, SD 3.7).¹⁵ In that study, 50% of the population were women, 50% had a higher education and 60% were patients recruited from a general practice.

Our finding that a large proportion of the patients had a suboptimal diet seems to be in accordance with other surveys of subjects with CHD.⁵⁻⁹ However, comparisons between studies must be made with caution, since different methods were often used to assess and present the quality of the dietary habits. Erkkila *et al.* found a moderate concordance with the recommended cholesterol lowering diet in Finnish subjects with CHD (N=415).⁷ Of the whole study group, 25% met the recommendations for saturated fat intake (<10 energy %) and 22% met the recommendations for fibre intake (≥ 27 g/d). In a small (N=36) Danish study by Dalgard *et al.*, 23% of the subjects met the Danish recommendations for the intake of fruit and vegetables (≥ 600 g/d).⁸ A survey by Svilaas *et al.* indicated that Norwegian CHD patients (N= 3 160) had slightly healthier dietary

habits than the general population for consumption of meat on bread and meat as a main dish, cheese, and butter and margarine in food preparation.⁶ The authors nevertheless pointed out that the patients' diet was suboptimal, especially for the consumption of fruit and vegetables (mean intake \approx 450 gram per day).

We found that educational level was significantly related to dietary habits after subjects have experienced CHD. Erkillla *et al.* found a similar association in men, but not in women.¹⁰ Unfortunately, because of the small number of women in our study, it was impossible to test any gender differences related to educational level. Our data also indicated that women seemed to have healthier dietary habits than men. This indication is in agreement with the findings of Svilaas *et al.*⁶ However Barzi *et al.*¹⁶ and Erkillla *et al.*¹⁰ reported no dietary differences related to gender. None of the other variables in the multiple regression model was significantly associated with the HDS. However, Barzi *et al.* found that smokers had poorer diet quality than non-smokers in their study.¹⁶ Our failure to find such an association could be due to low statistical power, since our sample consisted of only 15.5% smokers.

We found that 91.3% of the respondents had a suboptimal HDS. A partial explanation may partially be related to that health professionals have not taken this issue seriously enough,⁶ since 32.8% of the subjects in our study reported that they never had received information on the constituents of a healthy diet. Unfortunately, our study did not provide data that indicated the quality of the dietary information that were given to the rest of the sample.

Our study showed that the respondents' intakes of nonhydrogenated mayonnaise products, vegetables and fruit/berries/juice were particularly low. Respondents may think

that the high fat content of nonhydrogenated mayonnaise products makes them unhealthy, but actually the type of fat seems to be more important than the total amount of fat.¹⁷ Mayonnaise products high in nonhydrogenated unsaturated fat can therefore be good alternatives to meat on bread which is high in saturated fat. The low intake of fruit/berries/juice and vegetables in our sample are very unfortunate, since a high consumption of these food items are associated with a substantial risk reduction for CHD.^{1, 16, 18} Our finding possibly reflects the general low consumption of fruit and vegetables in Norway⁶ and the low level of knowledge about the very strong protective effect of these food items among the participants.

The consumption of alcohol seemed to be low in our sample (50% drinking less than one time per month). If the protective association between moderate alcohol consumption and CHD in observational studies is causal, then consuming one drink two to three times per week could lead to a substantial risk reduction for many of the participants in our study.¹⁹ Since we do not have full knowledge of whether the association between alcohol and CHD is causal, or whether advising subjects to drink alcohol “as a medicine” is safe, such advice can be problematic.²⁰ The high use of fish oil supplements among respondents (70.3%), was probably related to the well known protective effect it has against CHD mortality.²¹ The intake of vitamins was lower (41.7%), and probably reflects knowledge that vitamin supplementation has failed to improve prognosis in clinical studies.²²

There are several possible explanations for our finding that education level was associated with the HDS.^{23, 24} First, healthy behaviours may be influenced by the socio-economic context provided by family and friends in childhood. Furthermore, education

may directly improve important cognitive skills and larger self-efficacy and sense of control. Finally, education can lead to higher income, which might allow the choice of more expensive healthy food.

The gender differences we found regarding the HDS might be explained by women being more likely than men to actively inform themselves on health and nutrition through books and magazines. Furthermore, data have also indicated that some food items are regarded as masculine or feminine.¹¹ Examples of masculine food are fat meat, and examples of feminine food are lean meat and vegetables.

In conclusion, we found that 91.3% of the participants had a suboptimal diet quality. Thus, many of them could achieve a large risk reduction for premature death and new incidences of CHD, by changing their diet. Furthermore, our study indicated that the “high risk group” for having an unhealthy diet was men with low education. The main clinical implication from this study is that dietary counselling should be highly emphasized, and that a main goal should be to increase the consumption of fruit and vegetables, and to substitute some of the fatty meat on bread with nonhydrogenated mayonnaise products. Further studies are warranted to describe how to give high quality dietary counselling to subjects with CHD in ordinary and clinical settings, and to examine its effect on dietary habits.

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Tables

Table 1. Total and mean scores on a 15-item food questionnaire (SmartDiet™). N=116. a

Food items	Least healthy	Medium healthy	Most healthy	Mean score
1. Milk If you drink more than 1 litre of milk per week, what kind of milk do you usually drink?	Whole milk n=13 (11.2%)	Low-fat-milk or; less than 1 litre of milk per week or no milk at all n= 76 (65.5%)	Skimmed milk n=27 (23.3%)	2.12
2. Cream and other dairy products What kind of cream and other dairy products do you usually eat in food preparations, in coffee, in tea, as dressing? Except: milk, cheese	20% fat and more n=6 (5.2%)	10–20% fat n=24 (20.7%)	Less than 10% fat or: cream once per week or less n=86 (74.1%)	2.69
3. Bread and cereals What kind of bread and cereals do you usually eat?	Low fibre or: bread or cereals less than once daily n=1 (0.9%)	Medium high- fibre n=42 (36.2%)	Whole grain bread n=73 (62.9%)	2.62

Table 1 continues:

Food items	Least healthy	Medium healthy	Most healthy	Mean score
4. Butter and margarine on bread What kind of butter or margarine do you use on your bread?	Butter, hard margarine, butter blends, shortening and/or lard n=18 (15.5%)	Soft margarine n=22 (19%)	Margarine with highly unsaturated fat or: no butter or margarine n=76 (65.5%)	2.50
5. Cheese If you eat cheese at least once per week, what kind of cheese do you usually eat?	Whole fat cheese (more than 20% fat) n=40 (34.5%)	Medium fat cheese (10–20% fat) n=29 (25%)	Low-fat cheese (less than 10% fat) or: less than once per week n=47 (40.5%)	2.06
6. Meat on bread If you eat meat on your bread at least once per week, what kind of meat do you usually eat?	Fat meat n=42 (36.2%)	Medium-fat meat n=22 (19%)	Lean meat, or: meat on bread less than once per week n=52 (44.8%)	2.09

Table 1 (Cont.)

Food items	Least healthy	Medium healthy	Most healthy	Mean score
7. Fish on bread	On 1 slice of	On 2 to 4 slices of	On 5 or more	2.07
How often do you have fish on your bread? Salmon, mackerel, herring, sardines, cod, tuna fish, shrimps, crab, crabsticks etc.	bread per week or less n=29 (25%)	bread per week n=50 (43.1%)	slices of bread per week n=37 (31.9%)	
8. Nonhydrogenated mayonnaise products on bread	On 1 slice of	On 2 to 4 slices of	On 5 or more	1.27
How often do you use nonhydrogenated mayonnaise products on your bread?	bread per week or less n=89 (76.7%)	bread per week n=23 (19.8%)	slices of bread per week n=4 (3.5%)	
9. Meat as a main dish	High-fat cuts such	Medium-fat cuts	Lean cuts such as	2.58
What kind of meat do you usually eat as a main dish?	as regular hamburger, spare ribs, sausage, hot dog n=15; (13%)	n=65 (56%)	pork (loin, leg), veal and beef, or: no meat as a main dish n=36 (31%)	

Table 1 (Cont.)

Food items	Least healthy	Medium healthy	Most healthy	Mean score
10. Fish as a main dish How often per week do you have fish as a main dish?	Seldom or never n=2 (1.7%)	1 to 2 times per week n=45 (38.8%)	3 or more times per week n=69 (59.5%)	2.58
11. Fatty fish as main dish When you eat fish as a main dish; how often do you have fat fish? Salmon, trout, mackerel, herring, halibut etc.	Never n=22 (19%)	Less than half of the times n=57 (49.1%)	Half of the times or more n=37 (31.9%)	2.13
12. Butter and margarine in food preparation What kind of fat do you most often use in cooking?	Butter, hard margarine, butter blends, shortening and/or lard n=37 (31.9%)	Soft margarine n=37 (31.9%)	Oils, margarine with highly unsaturated fat or: usually no butter or margarine in food preparation n=42 (36.2%)	2.04

Table 1 (Cont.)

Food items	Least healthy	Medium healthy	Most healthy	Mean score
13. Vegetables How many portions of vegetables, including potatoes, do you eat per day? (1 portion = 150 g)	0–1 portion per day n=63 (54.3%)	2 portions per day n=43 (37.1%)	3 or more portions per day n=10 (8.6%)	1.54
14. Fruit, berries and juice How many portions of fresh fruit and berries, including juice, do you usually eat or drink per day? 1 portion = 1 apple, 2 clementines, 20 grapes, 2 dl berries, 1,5 dl juice etc.	0–1 portion per day n=69 (59.5%)	2 portions per day n=32 (27.6%)	3 or more portions per day n=15 (12.9%)	1.53
15. Snacks How often do you eat snacks, chocolate, cookies, donuts, cakes, sweet rolls, ice cream? Except: All kinds of nuts, almonds, marzipan, homemade popcorn and yoghurt ice.	4 times or more per week n=3 (2.6%)	2–3 times per week n=32 (27.6%)	Once per week or less n=81 (69.8%)	2.67

a Least healthy = 1 point; medium healthy = 2 points and most healthy = 3 points. The mean scores of the sample can therefore range from 1 to 3 points.

Table 2. Study participant characteristics (men and women, N=116)

Males, n (%)	87 (75)
Age, y (median, minimum-maximum)	66.5 (51–75)
Married/Cohabiting, n (%)	98 (84.5)
College/University degree, n (%)	20 (17.2)
Physical activity \geq 1 hour per week, n (%)	102 (87.9)
Described own health as good or very good, n (%)	68 (58.6)
Body mass index (weight/height ²), mean (SD)	27.17 (3.17)
Smoked daily or occasionally, n (%)	18 (15.5)
Drank alcohol \geq 1 time (s) per month, n (%)	58 (50)
Used vitamin/mineral supplements daily/occasionally, n (%)	48 (41.7)
Use omega-3 supplements daily/occasionally, n (%)	82 (70.7)
Received dietary advice from a health professional, n (%)	78 (67.7)
Received dietary advice at the hospital, n (%)	61 (52.6)
Received dietary advice from general doctor, n (%)	42 (36.2)
Thought a healthy diet is important or very important, n (%)	101 (87.1)
History myocardial infarction, n (%)	86 (74.1)
History of angina pectoris, n (%)	56 (48.3)

Table 3. Regression coefficients (reg. coeff) for linear association between different variables and the healthy diet score

Variables	n	Multivariate reg. coeff.	P value
Age	116	0.027	0.593
Gender			
Men	87	Ref.	
Women	29	2.318	0.020
Marital status			
Not married/cohabitating	18	Ref.	
Married/cohabitation	98	-0.305	0.774
Educational level			
Primary school	46	Ref.	
High school or College/university	70	2.271	0.003
Description of own health			
Poor or not so good	48	Ref.	
Good or very good	68	-0.360	0.631
Body mass index	116	0.186	0.116
Physical activity			
< 1 hour per week	14	Ref.	
≥ 1 hour per week	102	0.621	0.583

Table 3 (Cont.)

Variables	n	Multivariate reg. coeff.	P value
Importance of a healthy diet			
Non or little	15	Ref.	
Important or very important	101	1.680	0.108
Received dietary advice			
No	38	Ref.	
Yes	78	0.013	0.987
Smoking			
Daily or occasionally smokers	18	Ref.	
Non smokers	98	0.863	0.429
Alcohol			
Drink seldom/never	58	Ref.	
Drink ≥ 1 time (s) per month	58	0.514	0.520
Vitamin/mineral supplements			
Non users	68	Ref.	
Daily or occasional users	48	0.510	0.498
Omega-3 supplements			
Non users	34	Ref.	
Daily or occasional users	82	0.295	0.272

Figures

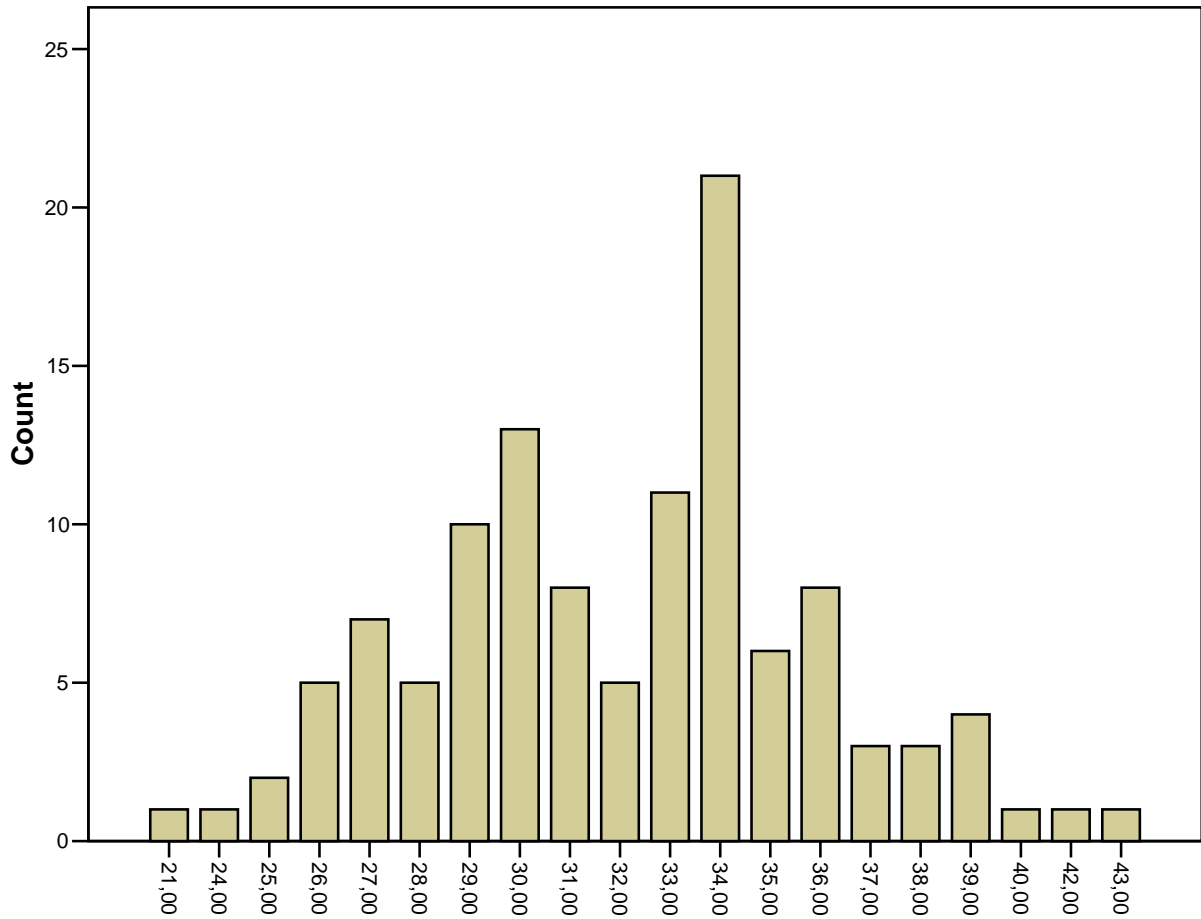


Figure 1. Healthy Diet Scores. N=116. Mean 32.09 (SD 3.96). Highest possible score was 45 points and lowest 15 points.