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ASSESSMENT OF NUTRITION KNOWLEDGE AND SOURCES OF NUTRITION INFORMATION AMONG MIDDLE- AND LONG-DISTANCE ELITE ATHLETES IN NORTH RIFT REGION OF KENYA

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ABSTRACT

Diet influences athletes performance while the foods chosen in training and competition determines how well competitors prepare and compete. Competitors should know about their nourishing objectives and how they can choose an eating technique to meet those objectives. However, there exists paucity of literature expounding on that. Many athletes have limited knowledge on matters of nutrition, and their nutrition practices do not conform to athletes' requirements. The sources of nutrition information among this group are also conflicting. The purpose of this study was to assess the nutrition knowledge and sources of nutrition knowledge among middle (800m-2500km) and long-distance (≤3000km) elite athletes in North Rift Kenya. Using already trained research assistants, a total of 30 athletic camps in Uasin Gishu and Nandi counties were visited allowing a return of 374 questionnaires. Majority of the respondents were males at 74%, results on age revealed that 47 % were between 22-28 years old and most elite athletes (55%) had an experience of 3 years and below. About 62% participated in long-distance running and 72% had attained secondary school level of education. From the nutrition knowledge scores generated, most of the athletes had adequate nutrition knowledge (above 50 %). With regard to specific questions, 51.9% had no knowledge that iron supplements should only be taken when one has iron deficiency. About three quarters (75.4%) had the right knowledge that athletes should not train on an empty stomach. The internet was the major source of nutrition knowledge information and nutritionists were least consulted on matters sports nutrition. There were no differences in knowledge among the athletes at different age groups (p =.510). Therefore, it is recommended that nutrition professionals be incorporated as part of technical team so as to ensure increased awareness among the athletes.

Key words*:* Knowledge, Performance, Sports, Nutrition, Elite, Middle and Long Distance Athlete

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INTRODUCTION

Athletics involve a variety of events of different categories which include running, walking, jumping or throwing. All athletic events are governed by the International Association of Athletics Federations (IAAF) which recognizes several disciplines including sprints, middle/long distance, hurdles, on track relays, throws and jumps, road running, race walks, cross-country, mountain running and ultra-running [1,2]. An elite athlete is considered as a runner who has participated in either a national or an international competition. Different types of athletic events call for different techniques and components of fitness through which skill training and proper nutrition play a key role in their acquisition [1]. It is every athlete's desire to train with optimal adaptation and recovery, maintain good health, reduce the risk of getting injured and achieve an event-oriented physique and to perform optimally during competitions [1]. Human nutrition describes the processes in which cellular organelles, cells, tissues, organs, systems and the body as a whole obtain and use nutrients to maintain structural and functional integrity [2]. For athletes to meet their nutritional needs, they should have nutritional knowledge to ensure they consume a variety of foods which supply optimum amounts of nutrients to the body. Foods rich in carbohydrates and fats are known to be good sources of energy for the body. Good nutrition practices as discussed above are key for optimal performance with minimal risk of injury [3, 4]. However, this depends on whether or not athletes have proper and adequate nutrition information. It also depends on whether or not the athletes are able to translate gained nutrition knowledge into practical proper nutritional habits [5]. Globally, studies on nutrition knowledge among athletes have not been conclusive [6, 7, 8]. Athletes have varying knowledge with different sources which influence their performance.

Optimum nutrition among athletes could go a long way in helping them achieve their target goals during competitions. Adequate nutrition knowledge could go a long way in ensuring that athletes make informed decisions regarding nutrient intake, ultimately optimising their performance. Once they have adequate nutrition knowledge, they become well equipped to own their diet.

Kenya has outstanding performance in middle- and long-distance races which has enabled it to be in the world's limelight. Studies have shown that Kenyan elite athletes have inadequate nutrition knowledge which have led to poor dietary practices [9, 10]. However, the two studies' focus was on athletes selected to participate in Berlin championship and college athletes respectively. There is still a paucity of literature focusing on nutrition knowledge and sources among elite athletes. Therefore, this study focused on the nutrition knowledge and nutritional information sources among middle- and long-distance elite athletes in North Rift Region in Kenya which is the base of elite middle- and long-distance athletics in the country.

MATERIALS AND METHODS

Study Site

The study took place in North Rift, Kenya. This region comprises eight counties: Baringo, Nakuru, Uasin Gishu, Turkana, Bungoma, Elgeyo Marakwet and Trans Nzoia.

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Among these counties, Nandi (0.1836° N, 35.1269° E) and Uasin Gishu counties (0.5528° N, 35.3027° E) were visited. These areas were selected because they have the highest number of athletes competing and winning in national and international competitions [11].

Study design

This study adopted a descriptive cross-sectional study design. The design involves collecting data at a single point in time. Descriptive surveys are formalized and usually organized and gather information using questionnaires [12].

Target Population

The study targeted all elite athletes residing in athletic camps in North Rift, Kenya. The participants had to have resided in the training camps for more than three months and participated in either national or international competitions. The study excluded athletes who were not in the camps at the time of data collection.

Sampling

Uasin Gishu and Nandi counties were purposefully selected for this study. This is due to the large number of athletes competing in national and worldwide events in these areas. Stratified sampling was used to select the camps to be included in this study. A total of 30 camps were selected; 23 from Nandi County and 7 from Uasin Gishu County, after which simple random sampling was employed to select the study participants. Cochran formulae was used to calculate sample size, as the athletes were more than 10,000 [13]. There was inconsistent data on the prevalence of poor nutritional practices among elite middle- and long-distance athletes in Kenya, therefore, standard procedure dictates use of prevalence of 50% in such cases [13]
A sample size of 384 was reached and 374 completed and returned the questionnaires, indicating 96.4% respondent rate. Therefore, the sample size was adequate.

Data Collection and Analysis

Data was gathered through the use of interviewee self-administered questionnaires which were adopted from previous researches and modified to meet the study objectives. Research assistants hand-delivered consent forms and questionnaires to the athletes and were available to interpret questions that were not understood by the athletes. The athletes were also required to answer questions regarding sports nutrition knowledge. Knowledge about nutrition was assessed using a Likert Scale with 6 items. Participants were to 'strongly disagree,' 'disagree,' be 'not sure,' 'agree' 'strongly' or 'agree' with the factors. 'Agree' and 'strongly agree' had a score of 3 and 4, respectively, while 'not sure,' 'disagree' and 'strongly disagree' had a score of 0, 2 and 1 respectively and vice versa for reverse coded questions. Twenty six items that were assessed on a yes and no basis were also scored. Responses were scored based on measurement scales used, with the answer 'yes' coded as 1 and 'no' coded as 0. Cumulative points ranged between 0 and 76. The Modified Bloom's cut off points were used for assessment of knowledge of nutrition in which scores ranging between 50-100% indicated good knowledge while scores <50% indicated poor knowledge. Therefore, the scores with the respective knowledge levels were good knowledge between 38 and a poor knowledge with score between 0 and 37. The collected data

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were coded, entered, cleaned and analysed using Statistical Package for Social Sciences (SPSS 25.0). One way Analysis of variance was used to assess the significant differences in nutrition knowledge among athletes of different age groups.

Ethical Considerations

The investigator sought consent from the Masinde Muliro University of Science and Technology Institution Ethics Review Committee (IERC) REF NO: MMU/COR: 403012 Vol (9). Clearance was also sought from National Commission of Science, Technology and Innovation (NACOSTI) REF NO: NACOSTI/P/18/41466/22412. The researcher also sought permission from Nandi and Uasin-Gishu counties authorities, REF NO:NC.EDU/14/1VOL.V (242) to carry out the study in the county training camps.

To ensure the principle of beneficence was upheld, a comparative risk/benefit assessment of the study was done by experts and in a bid to protect participants from psychological or social risk. The investigation guaranteed complete honesty of the discoveries of the study to the members.

The principle of justice was observed, and the participants' selection criteria were related to the purpose of the research and not merely based on the ease with which consent was likely to be obtained. Since the respondents knew about the investigation field's social standards, the examination ensured that words and language that appeared to be touchy to religion, incapacity, conjugal status or clan were avoided.

RESULTS AND DISCUSSION

Socio-Demographic Characteristics of the Respondents in the study population

The current study investigated the following socio-demographic characteristics; age, marital status, education level, years of experience as an athlete and gender aimed at identifying socio-demographic factors that affect nutrition knowledge among athletes. Summary of the results is presented in (Table 1). Results showed that out of 374 participants, majority were males at 74% (n=278). In regard to education level, most athletes had attained secondary school level 72% (n=270), a few 10% (n=36) had attained tertiary certificate level. With regard to age, 47.1% of the athletes were aged between 23-28 years and had less than 3 years of experience in athletics. About 41.7% reported that their major source of income was athletics. A proportion of 61.8% reported that they participated in long distance athletics.

Chi square test of independence was done to determine socio demographic factors that influenced nutrition knowledge. Bivariate analysis on demographic factors that are associated with nutritional knowledge shows that there was a significant relationship between level of education and knowledge in the study area (χ^2(df=4) =19.482, p=0.01) as shown in (Table 2). Income was statistically significantly (χ^2(df=4) =20.060, p=0.00) with knowledge. There was no significant relationship between knowledge and other demographic factors.

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Findings of this study in as far as demographic and socio-economic characteristics were concerned slightly differed with those of Nazni [16] whose research found out that among the surveyed athletes, majority were in the age of ≤23 years it was also observed that the study focused on male athletes only unlike the current study that involved both male and female athletes. Most athletes in her study had an experience of ≥5 years unlike in the current study which most of the participants reported of having an experience of ≤3 years. The results also differed in terms of level of education whereby most athletes had attained either undergraduate or postgraduate level as reported by Nazni [16]. In research by Baranauskas [17] athletes' average age was 17.7+-2.9 years and they had four years of experience. These findings differed from those of the present study, but they were similar in terms of gender, with more males participating in athletics than females.

The difference in age could be attributed to the fact that in Kenya, talent identification is not emphasized at an early age compared to other countries where athletes' talents are recognized while still in school and nurtured to competitive levels. In Kenya it is viewed as a source of livelihood rather than talent [16]. Talent identification in Kenya was hindered by inadequate sport facilities that were not well maintained, equipment, coaches and time for training [16]. The more the athletes practice while still at school contributes to them having more years of experience. This can be seen on the studies done among student athletes [17]. Differences in age were also observed where in the current study most athletes were between 23-28 years. This would be explained by the fact that previous studies focused on college athletes contrary to this study that was majorly on middle and long distance sport professionals [18].

Nutrition knowledge of the athletes in the study population

Data on nutrition knowledge was collected using a Likert scale. Those with response as strongly agree and agree were added together as well as those with disagree and strongly disagree, neither agree nor disagree was given a score of zero. Summary of the findings is shown in Table 3. A variety of methods are available to assist evaluators in gathering data. One of those methods involves the use of a scale. One of the most common scale types is a Likert scale. A Likert scale is commonly used to measure attitudes, knowledge, perceptions, values, and behavioural changes. A Likert-type scale involves a series of statements that respondents may choose from in order to rate their responses to evaluative questions [19]. Majority of the athletes 76.7% (n=287) had the right knowledge that carbohydrates taken 2-4hours before an event was an important source of fuel. However, 16% (n=60) had insufficient knowledge on eating carbohydrates 2-4hrs before an event. On the other hand, 40.9 % (n=153) of the athletes had the right knowledge of eating carbohydrates during performance whereas 47.1 % (n=176) lacked the correct knowledge on eating carbohydrates during an event. Another question tested on protein consumption 2-4hours before an event, 47.4 % (n=177) had the right knowledge that eating proteins 2-4hours before an event improved performance whereas 39.1 % (n=146) lacked the correct knowledge.

Athletes were also asked whether eating proteins 1-2hrs before an event improved performance, 35% (n=131) of the athletes lacked the right knowledge whereas 40.9% (n=153) had the right knowledge on protein consumption 1-2hrs before an event.

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Another question tested on the use of iron supplements without deficiency. Majority 51.9% (n=194) of the athletes lacked knowledge of this as they agreed to take supplements without deficiency whereas 33.7 % (n= 126) had the right knowledge that iron supplementation was not necessary without an iron deficiency. Another question tested on competing on an empty stomach where majority of the athletes, 75.4 % (n=282) agreed that it did not improve performance, whereas 15.8% (n=59) of the athletes lacked knowledge of this specific question. Results from the current study showed that slightly more than half (56%) of the elite athletes had adequate nutrition knowledge.

The findings of this study correspond with those of a previous study which found that the majority of athletes had appropriate nutrition knowledge [20, 21]. However, these findings differed with those of Torres [22] in which only 16% of surveyed athletes had adequate nutrition knowledge and that of Jessri [23] which reported that only 33% of athletes had higher knowledge scores. In general, athletes who understand the need of a well-balanced diet and demonstrate this understanding via their actions are seen to be more successful in sports [24].

Nutrition knowledge scores of respondents in the study population

In the second part, participants responded to 32 questions regarding knowledge of nutrition among middle- and long-distance elite athletes. Knowledge about nutrition was assessed using a Likert Scale with 6 items. Findings showed that a higher percentage of the respondents had good knowledge of nutrition (56%, n=208) and athletes with low knowledge accounted for 44 %(n=166).

Test of Hypothesis on Nutrition Knowledge

H_0:1There will be no significant differences in nutrition knowledge among athletes of different age groups.

The descriptive statistics associated with nutrition knowledge among athletes of different age groups are presented in Table 4. Descriptive results of this study indicated that nutrition knowledge was low among athletes aged 22 years and below (19.0±6.2, 95%CI=16.3-21.7) while it was high among those aged 29 years and above (20.1±4.6, 95%, CI=19.4-20.8). Between-groups ANOVA was conducted to test the hypothesis that age group affected nutrition knowledge.

Before conducting the ANOVA, the expectation of normal distribution was assessed and resolved to be fulfilled as the three groups were normally distributed with skewness and kurtosis not exactly |-1.0| and |1.0| individually. Moreover, the assumption of homogeneity of variance was tried and fulfilled confirmed on Levene's F test, F test (2, 371) = 2.67, p= .72.

The one-way between-groups ANOVA yielded a non-significant result F (2, 371) = .675, p = .510, ηp2= .01. Summary is provided on Table 4. Statistical power was not satisfactory and was equivalent to .510. To this regard, the null hypothesis of no significant differences in nutritional knowledge among athletes of various age brackets was acknowledged.

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The findings of the current study are contrary to results from a study done by Spendlove [27] who found that athletes' nutrition knowledge was strongly affected by their age. According to the same study, older female athletes scored the highest in mean nutrition knowledge, while younger male athletes scored the lower. The findings of the current study also disagree with the results of a study done by Hendrie [28] who found that age (p= 0.01) had a significant impact on sports nutrition expertise. The difference could be explained by the fact that other studies focused on student athletes who had access to nutrition information materials unlike in this current study where their minimal control or training on sports nutrition among athletes residing at the camps.

Sources of nutrition information among athletes in the study population

Athletes were asked about their preferred nutrition information sources (Table 5). They had a choice to select from magazines, internet and teammates among others. The results revealed that 35% (n=132) preferred magazines as their source of nutrition information whereas 65% (n=242) did not. When asked about the use of the internet, most 60% (n=225) preferred use of internet as the source of nutrition information whereas, 40% (n=149) did not prefer using internet to get nutrition information. 31% (n=117) preferred to consult their friends whereas 69% (n=257) had no confidence in friends as a source of nutrition information. A further 30% (n=111) agreed to have conferred with teammates while 70% (n=263) did not. Participants were asked whether they consulted family members or parents, only 19 % (n=72) preferred nutrition advice from parents compared to a majority 81% (n=302). On whether they got information from their coach or trainer, 58% (n=216) consulted their coach /trainer whereas 42% (n=158) did not on matters regarding nutrition. Only 20% (n=75) received information from a nutritionist /dietician whereas majority 80% (n=299) did not get access to a nutritionist. From the results, it was also revealed that 23% (n=87) preferred using TV as a source of nutrition information, however, 77% (n=287) did not. An item was included to find out if they received nutrition information from doctors, 33% (n=125) of athletes received nutrition information from a doctor whereas 67% (n=249) did not. A chi square test of independence was done to establish the relationship between sources of knowledge and knowledge levels. The nutritionist /dietician as a source of nutrition information was statistically significantly associated with knowledge ($\chi 2(df=1) = 11.448$, $p=0.01$). There was no significant relationship between nutrition knowledge and other sources of nutritional information (Table 6).

From the results of the current study, a nutritionist was the least source of information unlike the findings of a research done by Jessri [22, 24] which found that athletes' nutrition knowledge was mostly derived from their coaches. Results of this study also differed with the findings of a study by Devlin [25] which showed that 98% of athletes sourced for nutrition information from registered dieticians. For the current study, however, only a fifth of the athletes reported to be getting nutrition information form a nutritionist or dietician. Athletes should consult registered dieticians for comprehensive nutrition assessment and consultation, medical nutrition therapy, identification of nutrition problems that affect health and performance, and menu planning, among other

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services, as indicated by great variations on levels of nutrition knowledge among athletes [22].

CONCLUSION

This study concluded that majority of the athletes had adequate knowledge on nutrition. Internet was cited as the major source of nutrition information. There should be continuous nutrition education and counselling sessions on the importance of correct nutrition information among athletes. The study recommends that with the rampant use of internet among the athletes there is need for more online nutrition services as the world is progressing to more dependence on online material.

CONFLICT OF INTEREST

The researchers declare that there was no conflict of interest in conducting this study.

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Table 1: Socio-demographic information of the respondents in the study population

		N	Percentage (%)
Age group	≤ 22 Years	144	38.5
	23-28 Years	176	47.1
	≤ 29 Years	54	14.4
Years of experience	≤3 Years	204	54.5
	4-6 Years	98	26.2
	≥7 Years	72	19.3
Gender	Male	278	74.3
	Female	96	25.7
Type of race	Middle-Distance	143	38.2
	Long-Distance	231	61.8
Level of education	Primary	14	3.7
	Secondary	270	72.2
	Certificate	36	9.6
	Diploma	21	5.6
	Degree	33	8.8
Main income activity	Farming	87	23.3
	Casual Work	23	6.1
	Business	24	6.4
	Employed	84	22.5
	Running	156	41.7
Marital status	Single	266	71.1
	Married	99	26.5
	Divorced/Separated	6	1.6
	Deceased/Widowed	3	0.8

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Table 2: Relationship between socio demographic information and Knowledge levels

		Knowledge levels				
		Not Knowledgeable		Knowledgeable		Chi square($\chi 2$)
		N	%	N	%	
Age group	≤22 years	75	52.1	69	47.9	χ^2 (df=2) =0.230, p=0.891
	23-28 Years	87	49.4	89	50.6	
	≥ 29yYears	27	50.0	27	50.0	
Years of experience	≤3 years	105	51.5	99	48.5	χ^2 (df=2) =4.134, p=0.127
	4-6 years	42	42.9	56	57.1	
	≥7 years	42	58.3	30	41.7	
Gender	Male	135	48.6	143	51.4	χ^2 (df=1) =1.688, p=0.194
	Female	54	56.3	42	43.8	
Type of race	Middle-distance	78	54.5	65	45.5	χ^2 (df=1) =1.490, p=0.222
	Long-distance	111	48.1	120	51.9	
Level of education	Primary	9	64.3	5	35.7	χ^2 (df=4) =19.428, p=0.001
	Secondary	129	47.8	141	52.2	
	Certificate	12	33.3	24	66.7	
	Diploma	12	57.1	9	42.9	
	Degree	27	81.8	6	18.2	
	Others	0	0.0	0	0.0	
Main income activity	Farming	42	48.3	45	51.7	χ^2 (df=4) =20.060, p=0.00
	Casual work	6	26.1	17	73.9	
	Business	6	25.0	18	75.0	
	Employed	39	46.4	45	53.6	
	Others	96	61.5	60	38.5	
Marital status	Single	132	49.6	134	50.4	χ^2 (df=3) =3.064, p=0.382
	Married	51	51.5	48	48.5	
	Divorced/separated	3	50.0	3	50.0	
	Deceased/window	3	100.0	0	0.0	

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Table 3: Nutrition knowledge of the respondents in the study population

	SD N (%)	D N (%)	NA/D N (%)	A N (%)	SA N %
Eating carbohydrates 2-4hours before an event	42(11.2)	18(4.8)	27(7.2)	125(33.4)	162(43.3)
Eating carbohydrate during an event	96(25.7)	80(21.4)	45(12.0)	108(28.9)	45(12.0)
Eating protein 2-4hours before an event	78(20.9)	68(18.2)	51(13.6)	99(26.5)	78(20.9)
Eating protein 1-2hours before an event	90(24.1)	63(16.8)	90(24.1)	86(23.0)	45(12.0)
Taking iron supplements without having iron deficiency	72(19.3)	54(14.4)	54(14.4)	101(27.0)	93(24.9)
Training or competing on an empty stomach	213(57.0)	69(18.4)	33(8.8)	18(4.8)	41(11.0)

Note: ***SD****-Strongly Disagree;* ***D****-Disagree;* ***NA/D****-Neither Agree nor Disagree;* ***A****-Agree;* ***SA****-Strongly Agree*

Table 4: Descriptive statistics for nutrition knowledge scores across athletes

Age groups	n	M	SD	CI 95%	Skewness	Kurtosis	ANOVA
≥ 29Years	54	20.1	4.6	19.5-20.8	-.516	.976	F (2, 371) = .675, p = .510, ηp2= .01.
23- 28 years	176	19.2	2.9	17.3-21.2	-.733	.627	
≤ 22Years	144	19.0	6.2	16.3-21.7	-.912	.589	

***Note*. M= mean; SD = standard deviation; CI = confidence interval**

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Table 5: Sources of nutrition knowledge information by the athletes

	No N (%)	Yes N (%)
Magazines or books	242(64.7)	132(35.3)
Internet	149(39.8)	225(60.2)
Sporting organization	231(61.8)	143(38.2)
Friends	257(68.7)	117(31.3)
Teammates or fellow competitors	263(70.3)	111(29.7)
Family members or parents	302(80.7)	72(19.3)
Coach or trainer	158(42.2)	216(57.8)
Nutritionist or dietician	299(79.9)	75(20.1)
Television	287(76.7)	87(23.3)
Doctor	249(66.6)	125(33.4)

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Table 6: Relationship between sources of nutrition information and Knowledge levels

		knowledge levels				
		Not Knowledgeable		Knowledgeable		Chi square($\chi 2$)
		Count	Row N %	Count	Row N %	
Magazines or books	No	120	49.6	122	50.4	χ^2 (df=1)
	Yes	69	52.3	63	47.7	=0.247, p=0.620
Internet	No	81	54.4	68	45.6	χ^2 (df=1)
	Yes	108	48.0	117	52.0	=1.452, p=0.228
Sporting organization	No	111	48.1	120	51.9	χ^2 (df=1)
	Yes	78	54.5	65	45.5	=1.490, p=0.222
Friends	No	129	50.2	128	49.8	χ^2 (df=1)
	Yes	60	51.3	57	48.7	=0.038, p=0.845
Teammates or fellow competitors	No	132	50.2	131	49.8	χ^2 (df=1)
	Yes	57	51.4	54	48.6	=0.42, p=0.837
Family members or parents	No	147	48.7	155	51.3	χ^2 (df=1)
	Yes	42	58.3	30	41.7	=2.169, p=0.141
Coach or trainer	No	75	47.5	83	52.5	χ^2 (df=1)
	Yes	114	52.8	102	47.2	=1.029, p=0.310
Nutritionist or dietitian	No	138	46.2	161	53.8	χ^2 (df=1)
	Yes	51	68.0	24	32.0	=11.448, p=0.01
Television	No	141	49.1	146	50.9	χ^2 (df=1)
	Yes	48	55.2	39	44.8	=0.975, p=0.323
Doctor	No	129	51.8	120	48.2	χ^2 (df=1)
	Yes	60	48.0	65	52.0	=0.483, p=0.487
Other sources	No	177	49.7	179	50.3	χ^2 (df=1)
	Yes	12	66.7	6	33.3	=1.969, p=0.161

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