



RESEARCH ARTICLE

EXPORING USAGE OF SMART PHONE FOR ACCESSING NUTRITION INFORMATION AMONG COLLEGE GOING STUDENTS OF DELHI

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n – Number of Subjects
p- Statistical Value
NS- Non Significant
IOS – iPhone Operating System

ABSTRACT

This is an exploratory cross-sectional study undertaken among college going student to explore the present usage of smart phones for accessing nutrition information and factors affecting it. Data has been collected from randomly selected 200 college students (105 boys and 95 girls) by administering a questionnaire- cum interview schedule. The result revealed that statistically higher percentage of girls (58.9 %) than boys (41.0 %) were using their mobiles for obtaining nutrition information ($\chi^2=6.46$; $p=0.011$). Of these only 40.6 per cent subjects were reportedly induced behavior change subsequent to assessing nutrition information. Behavior changes induced were better food choices being made and better dietary habits. Most desired characteristics reported by students for encouraging access of nutrition information through smart phones were that information should be valid, authentic, attractive, creative, downloadable, unpaid with provision of off-line access. The frequency of use of smart phones for accessing nutrition information was positively associated with duration of usage of smart phones, perceived importance of nutrition in good health, use of smart phones for accessing emails and use of smart phones to search information as reported after applying Spearman Correlation. On the other hand participants who preferred seeking nutrition information from medical professionals did not prefer the use of smart phones for such information. It can be thus concluded that college going students in the present scenario are smart phone savvy and this can be successfully used as an opportunity for imparting nutrition education but its use is presently being undermined.

INTRODUCTION

Growth during adolescence is faster than at any other period in an individual's life except the first year. Good nutrition during adolescence is critical to cover the deficits suffered during childhood and should include all nutrients required to meet the present demands of physical and cognitive growth and development; provide adequate stores for illnesses and pregnancy; and prevent adult onset of nutrition-related diseases (Adolescent Nutrition, 2017). Unfortunately, during this phase, the tendency to engage in unhealthy dieting is rather common. The transition into late childhood and adolescence is characterized by undesirable changes in eating behaviors such as increased consumption of sugar sweetened beverages (e.g., soda) (Lytle *et al.*, 2000) calorie-dense, nutrient poor snacks (Seiga-Riz *et al.*, 1998) and food away from home (e.g., fast food) (Neilsen *et al.*, 2002) and a decline in the consumption of milk and other nutrient-dense foods (Fiorito *et al.*, 2006). Meal patterns also tend to change, as teenagers are more likely to skip breakfast (Lytle *et al.*, 2000) and less likely to participate in family dinners (Gillman *et al.*, 2000). All of these trends are associated with decreased diet quality (Bowman *et al.*, 2004; Mannino *et al.*, 2004) and may partially explain the fact that most adolescents are failing to meet the

majority of dietary recommendations (Munoz *et al.*, 1997). Vigorous physical activity declines markedly from high school to college as reported (Nelson *et al.*, 2007). The data from National Nutrition Monitoring Bureau (2012) emphasis that in India, the median intakes of all the major nutrients were less than RDA for children aged between 16-17 years in all the sampled states. Moreover the intake of all major food groups was also lower than the suggested levels (National Nutrition Monitoring Bureau, 2012). If adolescents are well nourished, they can make optimal use of their skills, talents and energies today, and be healthy and responsible citizens and parents of healthy babies tomorrow. To accomplish such a task, and in order to break the intergenerational cycle of malnutrition, a special focus for overcoming adolescent malnutrition is needed. This task can be accomplished by implementing strategic approaches to address these nutritional problems (Adolescent Nutrition, 2017). The Global Nutrition Report (2015) emphasizes promotion of mobile phones for knowledge sharing as an important potentially low risk and high pay off opportunity for action to end malnutrition in all its forms by 2030 (Global Nutrition Report, 2016). There is considerable enthusiasm for mobile-health interventions and it has been argued that there is huge potential for mobile-health interventions to have beneficial effects on health and health service delivery processes, especially in resource-poor settings (Woolford *et al.*, 2010). Since children and

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adolescents are familiar with the use of smart devices (Kim and Lee, 2013; Free *et al.*, 2013) new technology may be fully applied to these age groups for educational purposes. A range of questions regarding the effects of mobile technologies remain open to question including which functions are most effective (SMS, video, oral instruction, application software), which behavior change techniques are effective, and whether the effectiveness of interventions is influenced by setting or participant demographics (Free *et al.*, 2013). However, to gain an in-depth understanding of preferences and use of any source for imparting nutrition education, it is necessary to understand how the source is evaluated. Research studies have consistently suggested that consumers evaluate health information through internet by appraising both the quality and characteristics of health information through internet by appraising both the quality and characteristics of information, such as authoritativeness, trustworthiness, currency, and readability, as well as the design attributes of the websites, such as system usability, interface appearance, and information organization and presentation (Morahan-Martin, 2004; Eysenbach and Köhler, 2002; Cline and Haynes, 2001). In another study Escoffery *et al.* (2005) surveyed 743 college students on their use of Internet for health information and found that criteria for assessing web sites with health information important to college students are related to the accuracy, credibility, currency, clarity, and ease of understanding the health content rather than to the design and navigation of the Web page (Escoffery *et al.*, 2005). The usability of the sites was also an important factor, while website appearance, use of multimedia, and interactivity were reported as less important (Bree *et al.*, 1999). Therefore, despite the growing availability of a range of smart phones in the market, academic research on the usage of such technology for disseminating nutrition and health information among young adults is lacking which is an unfortunate omission. This technology friendly segment of the population speaks the language of computers, the internet, videos, social media, etc. and has different expectations of technology than the previous generation. Therefore, this exploratory study has been undertaken to examine smart phone use among the young college going students for accessing nutrition information and various factors affecting its usage. The specific objectives of the study are:

- Exploring the use of existing media for obtaining nutritional information by college going students.
- Identifying factors that may support or hinder the use of smart phones in activities related to imparting nutrition education among college going students.

MATERIALS AND METHODS

This is an exploratory cross-sectional study carried out among college students in New Delhi. Two colleges of University of Delhi were randomly selected for the study. Necessary permission to carry out the research work was obtained from the concerned authorities after explaining them the purpose of the study. Sample size has been estimated using the under given formula. Since there is no official data available about the percentage of smart phone users among college going students this percentage has been considered to be 50 per cent.

$$n = \left[\frac{DEFF * Np(1-p)}{[d^2/Z^2_{1-\alpha/2} * (N-1) + p*(1-p)]} \right]$$

n = sample size

N - population size (Taken over 1 million for a large population)

Design Effect -1 (for cross sectional survey)

P= expected prevalence (50%)

Z= Z statistic (1.28 for 80% level of confidence)

Considering this a sample size of 165 was computed. Further 20 per cent margin of non-responses was added to it and a final sample size of 200 college going students was derived for the study. For arriving at the sample size of 200, simple random sampling was adopted. From the two colleges selected for the study, list of all the students was obtained. Thereafter, 100 students (50 boys and 50 girls) were randomly selected from each college. Students pursuing nutrition as a subject in college were excluded from the study. For collecting data questionnaire-cum-interview schedule was developed and information was gathered on socio demographic profile using Kuppuswamy scale, 2015. Written consent was taken from all the participants involved in the study before collecting the data. Weight and height of each subject were measured based which body mass index of the subjects was determined. Data on occurrence of chronic or acute diseases was also collected for past three months. Further data was gathered on the frequency of using smart phones for various activities including accessing nutrition information, type of nutrition information searched using smart phones and perceived usefulness of the content obtained from various internet based sources as well as important desired characteristics of nutritional information on smart phones. The information was consolidated systematically and transformed scientifically into master coding sheet. Data was suitably cleaned and checked. SPSS software (Version 22) was used to do the statistical analysis of the quantitative data. The level of significance was taken to be less than 0.05 for the statistical tests.

RESULTS

In the present study, the age of the respondents ranged from 18 to 23 years with 58.5 percent aged between 18-20 years. The most common religion reported was Hindu (84.5 %) and majority belonged to general caste category (76 %). Further, categorization of socio-economic status according to Kuppuswamy scale indicates that 72.5 percent subjects belonged to upper middle class and very few were from upper lower class and none from lower class (Table 1). The mean weight and height was 66.9 kg and 167.1 cm for boys and 59 kg and 158.4 cm for girls respectively. Data on nutritional status was computed using BMI classification and it revealed that only 5 per cent subjects were underweight; 40 percent of the subjects had normal BMI whereas others were overweight/obese. Incidence of acute and chronic diseases caused in the family or experienced by the participants themselves were very few as reported. Data on perceived importance of health in daily life revealed that majority of the respondents (97.5 %) considered it as very important/important and 87.5 per cent subjects reported nutrition as being an important component for promoting health. There was no statistical difference observed in these perceptions among girls and boys ($P > 0.05$). Ranking by the respondents for the preferred sources for seeking health and nutrition information indicated that the medical professionals (like doctors, dieticians) were mostly preferred for obtaining nutrition information followed by traditional media sources like television, books and magazines. Family and friends were ranked next, higher than internet sources like websites and applications. Non-medical

professionals such as gym instructors, beauticians were least preferred for seeking any health or nutrition related information by the subjects. A 3 month recall on mobile phones usage revealed that statistically higher percentage of girls (58.9 %) than boys (41.0 %) were using their mobiles for obtaining nutrition information ($\chi^2=6.46$; $P=0.011$). Further, those subject who were using mobile phones for obtaining nutritional information were categorized as low, medium and high users according to the frequency of usage of mobile phones for searching information (Table 2). This data indicates that 39.3, 42.4 and 18.1 per cent subjects were low, medium and high users respectively. More girls (21.4 %) than boys (13.6) were high users, but no statistical difference was observed ($P>0.05$). In case of boys, the most frequently searched nutrition topics were reported to be weight loss/gain diets, high protein food products and dietary tips to increase muscle strength. Girls also reported weight management diets to be the most frequently searched topic followed by dietary tips to prevent hair fall or get glowing skin and dietary tips to avoid menstrual problems. There were many other themes which were being searched by both the genders like dietary tips to cure cold, fever, diet tips for thyroid problem or diabetes, gluten free diets, gym related food products and dietary tips to increase immunity. General web search engines (like Wikipedia, Google scholar and Yahoo) were the most preferred source being used by the subjects for obtaining nutrition information followed by video places like youtube. Very few subjects reported use of scientific search engines such as science-direct, pubmed or research gate to seek nutrition information. The third most preferred source was group communication applications, the most common one being WhatsApp and hike followed by social networking site commonest being facebook. Twitter was being used only by girls for accessing nutrition information as reported. Health and nutrition related websites were ranked next, the most common being healthkart.com, eatright.com, www.nutritio ulicious.com and fitness sites like gurumaan fitness.com, bodybuilding.com and growthfitness.com. The Apps were ranked as the least preferred source for seeking nutrition information. Among the Apps used, the most frequently used were IOS health app, fitbit and fitonomy.

However, similar trends were noticed in the mean preferences of these features among boys and girls ($P>0.05$). Behaviour change after accessing nutrition information through mobile phones was reportedly made by only 40.6 percent subjects. More girls (42.1 %) than boys (38.6 %) had induced behaviour change ($P>0.05$). Of the respondents who had reported that they had made changes in their behaviour, 40 per cent responded that after getting exposed to nutrition information through their smart phones they started having a healthier diet and were able to make better food choices. Almost same number of subjects reported that they were able to manage their weight after searching nutrition information through their phones. One-fifth of the subjects also reported that they got aware of the nutritional risk factors for various diseases hence avoided certain type of foods for prevention of diseases. Supporting our findings Ahern in his study reported that long-term maintenance of behavioral changes has been a problem in a number of nutrition education studies (Ahern, 2007). The subjects were probed to list most important characteristics they would want if information sharing and nutrition education through the smart phones has to be encouraged. The responses have been grouped under three main sub-categories: source of information, content and mobile related features.

There were various ideal characteristics mentioned by the subjects with respect to source of information as reported in table 3. Most of the subjects responded that the source should be valid or authentic. Students also reported that they wanted the source should be such that it is fast to access with no login is required. Other ideal attributes that the participants considered important were the source should updated, should have no disturbing features like advertisements or pop ups. Sources which are endorsed by health organization and other national bodies like WHO, UNICEF, Ministry of Food Processing etc. were also reported as desired. It was also noted that sources that frequently occurred on search engines were preferred. Almost 50 per cent participants wanted the content to be attractive followed by being creative. Other ideal characteristics considered important by the subjects in terms of content were that information should be valid, clear and easy to understand (Table 4).

The participants also said that they wanted the nutrition information to be updated or made interesting through examples. The students mentioned four main characteristics related to their mobile phones to be there while looking for nutritional information. Almost 50 per cent respondent said that information should be downloadable which occupies minimum memory storage in their phones. Other characteristic reported were unpaid information and offline facility so that the subjects could access information anytime and repeatedly as and when needed (Table 5). There were various factors studied which could affect the frequency of use of smart phones for searching nutrition information among students (Table 6). These factors were subjected to Spearman's correlation. The data revealed that the subjects who had been using their phones for longer periods of time had a higher chance of looking up nutrition information through it than the ones who had recently started using smart phones ($r = 0.202$; $P=0.04$). Another factor associated factor was the way in which the phones were being used. It was found that students who had a positive perception towards nutrition playing a very important role in maintaining good health were also using their smart phones more frequently for searching nutrition information compared to the ones who did not perceive nutrition as being important for a healthy livelihood ($r=0.20$; $P=0.047$). The students who were using their phones more frequently for accessing emails or searching any other forms of information were also more often looking up for nutrition information through their phones ($r= 0.288$; $P=0.004$). Therefore, it may be concluded that more the students use mobile phones for intellectual purposes, more they are likely touse it for searching nutrition information. On the other hand the participants who preferred seeking nutrition information from medical professionals had lower probability of it through their mobile phones ($r= -0.183$; $P=0.009$). The college going students are smart phone friendly and use it for various activities, however, awareness needs to be created for using it for assessing nutrition information. For this importance of nutrition in promoting healthy lifestyle also needs to be emphasized in various educational programmes. The quality of the nutrition information available on various internet sources should be improved in terms of being valid, authentic, reliable, user friendly, simple and available in downloadable format without occupying much storage space. Further, all programmes/ Apps should be made more attractive and interactive to be able to induce and sustain desired behavior change. It can thus be concluded that the nutritional status of urban adolescents remains poor and they need to be exposed to

Table 1. Distribution of the Subjects according to Socio-Economic Status using Kuppuswamy Scale

Socio-economic class	Score	Boys (n=105)	Girls (n=95)	Pooled Data (n=200)
Upper class	26- 29	20 (19.0)	19 (20.4)	39 (19.5)
Upper middle class	16- 25	76 (72.4)	69 (74.2)	145 (72.5)
Lower middle class	11- 15	4 (3.8)	5 (5.4)	9 (4.5)
Upper lower class	5- 10	5 (4.8)	0 (0.0)	5 (2.5)
Lower class	< 5	0 (0.0)	0 (0.0)	0 (0.0)

*Note: The figures in the parenthesis denote percentages

Table 2. Data on Frequency of Use of Smart Phone for Accessing Nutrition Information

Parameter	Frequency of usage per week	Boys (n=43)	Girls (n=56)	Pooled Data (n=99)
Low Usage	Once or twice	17 (39.5)	22 (39.3)	39 (39.3)
Moderate Usage	Three-four times	20 (46.5)	22 (39.3)	42 (42.4)
High Usage	More than 4 times	6 (13.9)	12 (21.4)	18 (18.1)

**($\chi^2=1.07$; $P=0.58$); *Note: The figure in the parenthesis denote percentages

Table 3. Data on Important Source Related Characteristics of Nutrition Information

Characteristic	Boys (n=105)	Girls (n=95)	Pooled (n=200)
Valid	52 (49.5)	44 (46.3)	96 (48.0)
Authentic	38 (36.1)	39 (41.0)	77 (38.5)
Updated	19 (18.0)	31 (32.6)	50 (25.0)
No login required	27 (25.7)	28 (29.4)	55 (27.5)
No extraneous features like no adds/ pop ups	25 (23.8)	20 (21.0)	45 (22.5)
Endorsed	23 (21.9)	21 (22.1)	44 (22.0)
Frequently occurring on the Search Engines	23 (21.9)	19 (20.0)	42 (21.0)

Note: The figure in the parenthesis denote percentages; *Multiple responses, therefore the percentages do not add to 100 per cent

Table 4. Data on Important Content Related Characteristics of Nutrition Information

Characteristic	Boys (n=105)	Girls (n=95)	Pooled data (n=200)
Valid	43 (12.3)	25 (15.7)	68 (34.0)
Attractive	50 (38.0)	53 (45.2)	103 (51.5)
Creative	45 (33.3)	37 (28.4)	82 (41.0)
Updated	38 (26.6)	25 (15.7)	63 (31.5)
Clarity	36 (24.7)	32 (23.1)	68 (34.0)
Easy to understand	32 (30.4)	25 (26.3)	57 (28.5)
Interesting	22 (11.4)	22 (12.6)	44(22.0)

*Note: The figure in the parenthesis denote percentages; ***Multiple responses, therefore the percentages do not add to 100 per cent

Table 5. Data on Important Mobile Related Characteristics of Nutrition Information

Characteristic	Male n(%)	Female n(%)	Pooled n(%)
Offline facility	38 (36.1)	38 (40.0)	76 (38.0)
Unpaid information	41 (39.0)	37 (38.9)	78 (39.0)
Downloadable	50 (47.6)	41 (43.1)	91 (45.5)
Minimum memory usage	16 (15.2)	27 (28.4)	43 (21.5)

*Note: The figure in the parenthesis denote percentages; ***Multiple responses, therefore the percentages do not add to 100 per cent

Table 6. Data on factors affecting usage of smart phones for nutrition information

Variable	N	Correlation coefficient	Sig (2-tailed)
Socio-demographic profile of the family (Kuppuswamy scale)	200	-0.105	0.301 ^{NS}
Nutritional status of the subject (BMI)	200	-0.074	0.466 ^{NS}
Incidence of acute diseases in the family	25	-0.13	0.536 ^{NS}
Incidence of chronic diseases in the family	25	-0.31	0.096 ^{NS}
Time period of usage of smart phones	30	0.202	0.044*
Perceived importance of health	200	-0.001	0.995 ^{NS}
Perceived importance of nutrition in maintaining good health	200	0.20	0.047*
Frequency of usage of phone for calling	200	-0.109	0.85 ^{NS}
Frequency of usage of phone for taking pictures	200	0.138	0.175 ^{NS}
Frequency of usage of phone for recreational activities	200	0.173	0.09 ^{NS}
Frequency of usage of phone for social media	200	-0.056	0.584 ^{NS}
Frequency of usage of phone for reading content	200	-0.12	0.242 ^{NS}
Smart phones often being used to access emails	200	0.288	0.004*
Medical professionals (doctors, dieticians) being preferred for seeking nutrition information	200	-0.183	0.009*
Preference for internet based sources for nutrition information	200	-0.006	0.956 ^{NS}
Preference for non- medical professionals for seeking nutritional information	200	-0.062	0.545 ^{NS}
Preference for other human sources for seeking nutritional information	200	0.096	0.343 ^{NS}
Use of traditional media like TV, radio for nutrition information and education	200	-0.033	0.747 ^{NS}

***Statistically significant ($P<0.05$), NS-non- significant

nutritional knowledge which would help them lead a better quality life. Since, this generation is smart phone savvy, it can be successfully used as an opportunity for imparting nutrition education but its use is presently being undermined.

DISCUSSION

This study provides insight into the extent of use of smart phones for obtaining nutrition information and various factors affecting the same among students in Delhi. The salient findings have been discussed here. Majority of the subjects in the study reported health to be an important component of life however importance of nutrition in sustaining a healthy life was undermined by them. Moving on in any educational programme for improving wellbeing of individuals, the role of nutrition in healthy lifestyle should also be emphasized. There is evidence that nutritional and environment determinants of growth and development can influence health and wellbeing which in turn can influence nations' burden of malnourished individuals and public health problems (Neumark-Sztainer *et al.*, 2004; Talwar *et al.*, 2016; Duyar and Özener, 2005). The study revealed that most preferred source for seeking nutrition information was medical professionals. Non-medical professionals such as gym instructors, beauticians were the least preferred source. Further, it was also noticed that students were seldom inclined towards using internet sources to look for nutrition information. Talwar *et al.* (2016) in their review article mentioned that the role of mobile technology in medicine and healthcare is seen to be promising and technologically exciting to use although there is an immense need for developing guidelines for standardizing smartphone-based healthcare applications so that the applications are used together seamlessly for specific purposes. They also said that full potential of smartphones has yet to be exploited (Duyar and Özener, 2005). Smart phones were mostly getting used for calling, social networking, taking photographs while accessing emails, reading and searching information on the phone were the less preferred activities taken up by adolescent and hence mobile phones are still getting under used for information and education purposes. It can also be concluded that accessibility for accessing nutrition information exploring smart phones was higher for girls than boys. Women appear to be taking the lead when it comes to smart phone technology phone use in United Kingdom as well with 56 percent owning a smart phone compared with 51 percent men. This also translates to using health applications (apps) with around 9 percent women more likely to use these compared with 4 percent men (Women Taking the Lead When It Comes to Mobile, 2013). Besides, for most college student's nutrition was still confined to weight management irrespective of gender. The cultural context in India has changed in the past few years (Srinivasan *et al.*, 1998). A global review quoted that in India there is a shift towards the concept of thin body image is occurring among girls of urban areas through mass media. A majority of girls are interested in attaining thin body image which sometimes leads to dissatisfaction over body weight (Mallick *et al.*, 2014). This could be a major reason for college going students confining nutrition till weight management only. Hence, there is a need for creating awareness among college students for understanding the broader role nutrition plays in our life especially in preventing chronic diseases, develop immunity and most importantly improving well being. The study also highlights that nutrition information accessed through smart phones did not supported behaviour change in most cases. Lack of constant motivation and tailor made guidance were

reported to be major barriers for inducing behaviour change in the study. Contrary to the present study a cross-sectional study in Ghana reported that 72 per cent university students had induced lifestyle or health behaviour change after their contact with online information (Asibey *et al.*, 2017). A systematic review concluded that mobile electronic devices have the potential to facilitate weight loss in overweight and obese populations, but further work is needed to understand if these interventions have sustained benefit and how we can make these mHealth tools most effective on a large scale (Khokhar *et al.*, 2014). Another qualitative study done on college going students in United Kingdom concluded that in case of smart phone applications young, currently healthy adults have some interest in apps that attempt to support health-related behavior change but accuracy, legitimacy, security, effort required, and immediate effects on mood emerged as important influences on app usage (Dennison *et al.*, 2013). Since, majority of the students did not make any behavior modification in the present study hence it may be concluded that there is a need to provide information with desired characteristics which should be backed by constant guidance and motivation. But nevertheless smart phone technology appears to hold great promise in the future in terms of helping to deliver health behavior changes (Hebden *et al.*, 2012). During the study, some ideal characteristics of making nutrition information more user friendly through mobile phone technology was identified which included higher validity or authenticity of the sources well as endorsement by health organizations. A review concluded that smart phone apps developed by experts are generally considered to be more preferable than those from unknown or less reputable sources (Vodopivec-Jamsek *et al.*, 2012). With respect to content it was reported that it should be attractive, valid, clear, updated and explained through examples for easy understanding. Some other characteristics preferred by students were that the information to be downloadable making offline access feasible and unpaid. With increase in duration of the usage of smart phones, higher perceived importance of nutrition in maintaining good health and often use of smart phones for intellectual purposes, there is greater possibility that user will use smart phones for accessing nutrition information. Given the extent and associated healthcare costs of specially non-communicable diseases which has higher prevalence in urban areas all over the world preventive health care has the potential to play a key role in reducing the prevalence of these conditions, with approaches such as mobile messaging and app usage offering a convenient and cost-effective way to reinforce desirable behaviors (Ahern, 2007).

Conclusion

It can thus be concluded from the present study that since the nutritional status of urban adolescents is poor they need to be exposed to nutritional knowledge which would help them lead a better quality life. Since, this generation is smart phone savvy, it can be successfully used as an opportunity for imparting nutrition education but its use is presently undermined. The college going students are smart phone friendly and use it for various activities, however, awareness needs to be created for using it for assessing nutrition information. For this importance of nutrition in promoting healthy lifestyle also needs to be emphasized in various educational programmes. The quality of the nutrition information available on various internet sources should needs to be improved in terms of being valid, authentic, reliable, user

friendly, simple and available in downloadable format without occupying much storage space. Endorsement would be an added benefit. Further, all programmes/ apps should be made more attractive and interactive to be able to induce and sustain desired behavior change.

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