Original Article

Access this article online
Quick Response Code:

Website: www.jehp.net
DOI: 10.4103/jehp.jehp_756_19

Effect of Information, Education, and Communication activity on health literacy of cardiovascular diseases among school-going adolescents in Delhi

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Abstract:

BACKGROUND: Heart attack and stroke account for >80% of deaths due to cardio-vascular diseases (CVDs) in India. Adolescents are the most susceptible group to adopt risky behaviors causing CVDs such as use of tobacco and alcohol, sedentary lifestyle, and unhealthy diet. This study was conducted to assess the health literacy of CVDs such as heart attack and stroke among school-going adolescents and change in health literacy after different information, education, and communication (IEC) activities.

MATERIALS AND METHODS: It was a school-based interventional study conducted in two schools among students of classes 6, 7, and 8. The educational interventions were done in the form of pamphlets, posters, and lectures on heart attack and stroke. The postintervention data were collected 2 weeks after the first intervention and 3 months after the last intervention.

RESULTS: There were a higher proportion of students with satisfactory level of knowledge of heart attack and stroke both at 2 weeks and 3 months after the interventions in both the schools, and the results were statistically significant ($P < 0.05$).

CONCLUSION: The health literacy regarding CVDs has improved when compared to baseline after IEC activities among school-going adolescents.

Keywords:

Adolescents, education and communication, heart attack, health literacy, information, stroke

Introduction

Cardiovascular diseases (CVDs) are the number one cause of death globally. An estimated 17.9 million people died from CVDs in 2016, representing 31% of all global deaths. Almost four out of five CVD deaths are due to heart attacks and strokes.[1] Risk factors and risk behaviors that increase the risk of CVDs begin in adolescence and the persistence of these factors worsen CVD risk later in life.[2] Many CVD risk factors surface in adolescence[3] and track forward to adulthood;[4] interventions should be started at an early age as it takes time for healthy practices to blend into behavior. With this emphasis, adolescents should be made health literate at an early age so that the emergence of risk factors and risky behaviors may be prevented.

According to the World Health Organization (WHO), health literacy is defined as the cognitive and social skills which determine the motivation and ability of individuals to gain access to understand and use information in ways which promote

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Received: 17-12-2019
Accepted: 23-12-2019
Published: 27-02-2021

How to cite this article: Yadav S, Khokhar A. Effect of Information, Education, and Communication activity on health literacy of cardiovascular diseases among school-going adolescents in Delhi. J Edu Health Promot 2021;10:71.

and maintain good health. It is more than simply being able to read pamphlets, make appointments, understand food labels, or comply with prescribed action from a doctor.[5] School is a key location for educating children about health and for putting in place the interventions to promote the health of children.[6] An adequately health literate individual can communicate with health professionals; understand and use the health materials (in a variety of formats) that they need to stay healthy; and apply health-related knowledge to health care and decision-making so that they are able to make healthy choices.[7]

There have been many studies conducted to assess the awareness of CVDs among school-going adolescents, but only a few studies are there in which the effect of educational interventions on health literacy of CVDs among school-going adolescents has been assessed. Hence, this study was conducted to assess the health literacy of CVDs among school-going adolescents and to assess the effect of different information, education, and communication (IEC) activities on health literacy of CVDs (heart attack and stroke) among school-going adolescents.

Materials and Methods

A school-based, interventional study was conducted in 2016 in Najafgarh (New Delhi). From the total of 13 schools in Najafgarh area, two schools were selected by simple random sampling Students of classes 6, 7, and 8 from both the schools were included in the study.

The sample size was calculated based on the study conducted by George *et al*. in 2014 in two government and one private school in central Delhi, in which it was found that 34.6% (the least, P_1) of the students had the knowledge that by exercising for at least 1 h a day, CVDs can be prevented.[8] In the present study, the knowledge was expected to increase to up to 60% (P_2) after the intervention. Taking an alpha error (α) and a beta error (β) of 5% and 20%, respectively, the sample size was calculated using the following formula:

$$n_1 = n_2 = \frac{\{z_1 - \left(\frac{\alpha}{2}\right)\sqrt{\left[2 \times Pm(1 - Pm)\right]} + z_1 - \beta\sqrt{\left[P_1(1 - P_1) + P_2(1 - P_2)\right]}\}}{P_1 - P_2}$$

where $z_1 - (\alpha/2) = 1.96$,

$P_1 = 0.34$, $P_2 = 0.60$, $P_{m} = P_1 + P_2/2 = 47.3\%$ (0.473)

with $n = 51$,

design effect = 2,

loss to follow-up or nonresponse of up to 10%, the sample size came out to be 120.

There were four to five sections each of classes 6, 7, and 8. Thus, one section each of classes 6, 7, and 8 was selected by simple random sampling. There were varied number of students in these sections, so all students studying in these selected sections, who were present during the study, were included in the study. Thus, a total of 120 students from classes 6, 7, and 8 from each school were enrolled.

A pretested, semi-structured, self-administered questionnaire based on the materials to be used for intervention was used for baseline and postintervention data. The questions were based on the IEC material adapted from the WHO and Central Health Education Bureau (CHEB). The outcome of the study was change in awareness of students as compared to baseline at 2 weeks and 3 months after repeated educational intervention. The students were categorized as having satisfactory and unsatisfactory knowledge of CVDs (cutoff score was 50%) The questionnaire comprised questions related to demographic information; general awareness of CVDs; knowledge of risk factors; and symptoms, preventive, and treatment measures of heart attack and stroke. It measures the knowledge of students regarding CVDs at baseline and 2 weeks after the first intervention and 3 months after the last intervention to measure both immediate and long-term memory. The response options were yes/no/don't know. Some questions were open ended also. Each right answer was awarded score 1 and wrong answer as 0. No response was considered as incorrect response and scored 0. The responses were scored and categorized as unsatisfactory (<50%) and satisfactory (>50%) knowledge. The maximum score of questions of heart attack and stroke was 16 and the minimum score was 0. The intervention was given in the form of IEC activity with the help of posters and pamphlets taken from the WHO office and CHEB for school 1 and lecture from the same reference material was prepared in PowerPoint presentation for school 2.

After the baseline evaluation in the month of June in both the schools, the intervention was done in the next visit in the month of July by giving the pamphlets to the students and displaying posters in their classes and common areas. The postintervention data were obtained after 2 weeks from both the schools by administering the same questionnaire. Subsequently, the respective interventions were repeated two more times, monthly among the students of both the schools in August and September for reinforcing the knowledge. Thus, the interventions were given a total of three times in the span of 3 months and postintervention data were also obtained at 3 months from the last intervention, i.e., in

January. Thus, postintervention data were obtained two times – first at 2 weeks after the first intervention and the other after 3 months from the last intervention.

Ethical considerations

Approval from the Institutional Ethical Committee of VMMC and Safdarjung Hospital (S. No. IEC/VMMC/SJH/Thesis/October-2015, dated October 30, 2015) was obtained prior to the study. Permission from the Deputy Directorate of Education, South-West Delhi, and consent of the school principals were taken after explaining the objectives and methods of the study.

Assent from the study participants and consent from the parents of the study participants were taken. Privacy of the study participants and the confidentiality of the information obtained were maintained. The participants were explained prior to inclusion that they had rights to withdraw at any time during the study.

Data analysis

Data analysis was done using Statistical Package for Social Sciences (SPSS) software for windows version 17.0. Released 2008 (SPSS Inc., Chicago, IL). All the values were analyzed by using descriptive statistics to calculate frequencies, mean, range, and standard deviation. Chi-square test was applied to compare the proportion of scores (satisfactory and unsatisfactory) at baseline, 2 weeks, and 3 months, and $P < 0.05$ was considered statistically significant.

Results

There were a total of 120 students each in both the schools. The mean age of students of both the schools was 12.2 years. Majority of the students of both the schools belonged to nuclear family and socioeconomic class IV according to the Modified BG Prasad scale, 2017. Majority of the students' parents were educated till primary, as shown in Table 1.

From school 1, majority of the students knew that stress was the risk factor of heart attack, whereas in school 2, majority of the students knew that smoking was the risk factor of heart attack. The least known risk factor of heart attack in school 1 was physical inactivity and in school 2, family history of heart attack was the least known risk factor among students, as shown in Table 2.

In school 1, chest pain was the maximally known symptom of heart attack and in school 2, difficulty in breathing was the maximally known symptom of heart attack. The least known symptom of heart attack known among students of both schools was shoulder pain. Similarly, from school 1, improper diet was the maximally known risk factor of stroke, whereas in school 2, hypertension (HTN), obesity, long work hours, and increased cholesterol were the maximally known risk

Table 1: Distribution of the study participants according to sociodemographic characteristics

Demographic variables	School 1 (*n*=120), *n* (%)	School 2 (*n*=120), *n* (%)
Age (years)		
Mean	12.2±1.2	12.2±0.9
Range	6 (10–16)	6 (10–16)
Sex		
Boys	32 (26.7)	66 (55.0)
Girls	88 (73.3)	54 (45.0)
Religion		
Hinduism	111 (92.5)	115 (95.8)
Others	9 (07.5)	5 (04.2)
Class		
6th	25 (20.8)	32 (26.7)
7th	30 (25.0)	42 (35.0)
8th	65 (54.2)	46 (38.3)
Type of family		
Nuclear	82 (68.3)	65 (54.2)
Joint	38 (31.7)	55 (45.8)
SES*		
I	3 (02.5)	12 (10.0)
II	13 (10.8)	21 (17.5)
III	30 (25.0)	31 (25.8)
IV	55 (45.9)	36 (30.0)
V	19 (15.8)	20 (16.7)
Father's education		
Illiterate	13 (10.8)	4 (03.3)
Primary	39 (32.5)	12 (10.0)
Middle	22 (18.4)	40 (33.3)
High	24 (20.0)	22 (18.3)
Senior secondary	13 (10.8)	24 (20.0)
Graduate	8 (06.7)	17 (14.3)
Postgraduate	1 (0.8)	1 (0.8)
Mother's education		
Illiterate	37 (30.9)	12 (10.0)
Primary	44 (36.7)	27 (22.5)
Middle	17 (14.1)	33 (27.5)
High	18 (15.0)	20 (16.7)
Senior secondary	4 (03.3)	16 (13.3)
Graduate	0 (0)	12 (10.0)
Postgraduate	0 (0)	0 (0.0)
Parents' employment status		
Gainfully employed	120100)	120 (100)
Unemployed	0 (0)	0 (0)

*Socioeconomic class according to the Modified BG Prasad Scale, 2017. SES=Socioeconomic status

Table 2: Distribution of the study participants according to the general awareness of cardiovascular diseases

General information	School 1	School 2
Heart attack		
Know what is heart attack	62 (51.7)	78 (65.0)
Know that heart attack can be prevented	82 (68.3)	89 (74.2)
Stroke		
Know what is stroke	8 (06.7)	1 (0.8)

factors of stroke. The least known risk factor of stroke in school 1 was lack of physical exercise and in school 2, the least known risk factor of stroke was stress and improper diet, as shown in Table 3.

There was a higher proportion of students with satisfactory level of knowledge of heart attack and stroke after 2 weeks of intervention in both the schools, and the difference was statistically significant ($P < 0.05$), as shown in Table 4.

There was a higher proportion of students with satisfactory level of knowledge of heart attack and stroke after 3 months of intervention in both the schools, and this difference was statistically significant ($P < 0.05$), as shown in Table 5.

There was a loss to follow-up in both the schools during the interventions. At 2 weeks, there was an attrition rate of 7.5% in school 1 and 4% in school 2 and at 3-month follow-up, there was an attrition of 21% in both the schools.

Table 3: Distribution of the study participants of both the schools according to awareness of risk factors and symptoms of heart attack and stroke at baseline evaluation

Response	School 1 (*n*=120)			School 2 (*n*=120)		
	Yes, *n* (%)	No, *n* (%)	Don't know, *n* (%)	Yes, *n* (%)	No, *n* (%)	Don't know, *n* (%)
Risk factors of heart attack						
Increased blood cholesterol	35 (29.2)	20 (16.7)	65 (54.1)	62 (51.7)	16 (13.3)	42 (35.0)
Smoking	42 (35.0)	20 (16.7)	58 (48.3)	65 (54.2)	24 (20.0)	31 (25.8)
Diabetes	31 (25.8)	26 (21.7)	63 (52.5)	34 (28.3)	40 (33.3)	46 (38.4)
Weight gain	21 (17.5)	19 (15.8)	80 (66.7)	41 (34.5)	41 (34.5)	38 (31.7)
Stress	43 (35.8)	17 (14.2)	60 (50.0)	48 (40.0)	21 (17.5)	51 (42.5)
Family history of heart attack	27 (22.5)	28 (23.3)	65 (54.2)	18 (15.0)	57 (47.5)	45 (37.5)
Physical inactivity	10 (08.4)	31 (25.8)	79 (65.8)	30 (25.0)	38 (31.7)	52 (43.3)
Symptoms of heart attack						
Chest pain	69 (57.5)	9 (7.5)	42 (35.0)	99 (82.5)	7 (5.8)	14 (11.7)
Sweating	33 (27.5)	32 (26.7)	55 (45.8)	49 (40.8)	38 (31.7)	33 (27.5)
nervousness	61 (50.8)	9 (7.5)	50 (41.7)	92 (76.6)	14 (11.7)	14 (11.7)
Difficulty in breathing	65 (54.2)	9 (7.5)	46 (38.3)	101 (84.1)	5 (4.2)	14 (11.7)
Shoulder pain	13 (10.8)	37 (30.8)	70 (58.4)	20 (16.7)	58 (48.3)	42 (35.0)
Unconsciousness	43 (35.8)	16 (13.3)	61 (50.9)	60 (50.0)	37 (30.8)	23 (19.2)
Risk factors of stroke						
HTN	6 (5.0)	4 (3.3)	110 (91.7)	4 (3.3)	3 (2.5)	113 (94.2)
Smoking	6 (5.0)	3 (2.5)	111 (92.5)	2 (1.7)	3 (2.5)	115 (95.8)
Diabetes	6 (5.0)	3 (2.5)	111 (92.5)	3 (2.5)	4 (3.3)	113 (94.2)
Obesity	9 (7.5)	3 (2.5)	108 (90.0)	4 (3.3)	1 (0.8)	115 (95.9)
Stress	9 (7.5)	3 (02.5)	108 (90.0)	2 (1.7)	0 (0)	118 (98.3)
Lack of physical exercise	4 (3.3)	3 (2.5)	113 (94.2)	0 (0)	1 (0.8)	119 (99.2)
Long work hours	09 (7.5)	3 (2.5)	108 (90.0)	4 (3.3)	0 (0)	116 (96.7)
Improper diet	11 (9.2)	1 (0.8)	108 (90.0)	2 (1.7)	0 (0)	118 (98.3)
Increased cholesterol	6 (5.0)	2 (1.7)	112 (93.3)	4 (3.3)	0 (0)	116 (96.7)

*Multiple responses are possible. HTN=Hypertension

Table 4: Comparison between level of knowledge of heart attack and stroke at baseline and 2 weeks after intervention in schools 1 and 2

School 1	Before intervention	2 weeks	School 2	Before intervention	2 weeks
Heart attack					
Satisfactory	12 (10.0)	62 (55.9)	Satisfactory	74 (61.7)	94 (81.7)
Unsatisfactory	108 (90.0)	49 (44.1)	Unsatisfactory	46 (38.3)	21 (18.3)
Total	120 (100)	111 (100)	Total	120 (100)	115 (100)
P	<0.05		*P*	<0.05	
Stroke					
Satisfactory	5 (4.2)	37 (33.3)	Satisfactory	10 (08.3)	60 (52.2)
Unsatisfactory	115 (95.8)	74 (67.7)	Unsatisfactory	110 (91.7)	55 (47.8)
Total	120 (100)	111 (100)	Total	120 (100)	115 (100)
P	<0.05		*P*	<0.05	

Table 5: Comparison between level of knowledge of heart attack and stroke at baseline and 3 months after intervention in schools 1 and 2

School 1	Before intervention	3 months	School 2	Before intervention	3 months
Heart attack					
Satisfactory	12 (10.0)	58 (61.7)	Satisfactory	74 (61.7)	79 (83.2)
Unsatisfactory	108 (90.0)	36 (38.3)	Unsatisfactory	46 (38.3)	16 (16.8)
Total	120 (100)	94 (100)	Total	120 (100)	95 (100)
P	<0.05		*P*	<0.05	
Stroke					
Satisfactory	5 (4.2)	31 (33.0)	Satisfactory	10 (8.3)	59 (62.1)
Unsatisfactory	115 (95.8)	63 (67.0)	Unsatisfactory	110 (91.7)	36 (37.9)
Total	120 (100)	94 (100)	Total	120 (100)	95 (100)
P	<0.05		*P*	<0.05	

Discussion

Increasing trends of noncommunicable diseases (NCDs) is a worldwide phenomenon. Mortality, morbidity, and disability due to major NCDs account for about 60% of all deaths and 47% of the global burden of disease.[1] India is facing a dual burden of communicable diseases as well as NCDs. NCDs such as heart attack and stroke in adults have been related to the prevalence of risk factors in childhood.[9] Thus, it is also people with low health literacy use fewer preventive and health promotion services and make more use of accident and emergency services. Hence, there is a definite need to prevent the emergence of risk factors such as sedentary lifestyle, smoking, alcohol consumption; assess the health literacy regarding NCDs among adolescents; and plan interventional measures for the same. Limited health literacy is independently associated with unhealthy lifestyle behaviors such as smoking, alcohol consumption, insufficient exercise, and inadequate fruit and vegetable consumption – all of which are major risks for premature morbidity and mortality.

Good childhood health literacy has also been found to be positively associated with healthier diet.[9] Adolescents are at a crucial stage of development characterized by many physical, emotional, and cognitive changes. They have advanced cognitive abilities and an improved capacity for processing information, can think more abstract ideas, and use reasoning skills.

In our study, 68.3% of the students in school 1 and 74.2% of the students in school 2 knew that heart attack could be prevented. In another study conducted by Banerjee in Pune in 2007, a total of 42.6% of students were of the opinion that coronary heart disease (CHD) is preventable.[10] The difference may be due to different study settings. Similarly, in a study conducted by Divakaran *et al*. in 2013 in Pariyaram in Kannur district of Kerala, only 9.6% of the students felt that CVDs could be prevented.[11] The reason for this difference may be again the difference in the study settings. In another study conducted by Mane *et al*. in 2010 in Davangere, Karnataka, 73% of the students in government schools and 70% in private schools were aware that CVD could be prevented.[12] George *et al*. in a study conducted in 2012 in Delhi in both government and private schools observed that about 80% of the students knew that heart diseases are preventable,[8] and the results of these studies are comparable with those of our study.

In our study, stress and smoking were the maximally known risk factors of heart attack, and lack of physical activity and family history of heart attack were the least known risk factors of heart attack. In a study conducted by Mane *et al*. in 2010 in students of classes 8–10 in a government school in Karnataka, they also found that stress was the maximally known risk factor of heart attack and physical inactivity was the least known risk factor of heart attack among the students,[12] which is similar to our study. Similarly, in another study conducted by Ramya *et al*. in 2014 in Thrissur, Kerala, they found that among students heavy alcohol consumption, smoking, and HTN were perceived as important top three risk factors for heart attack and diabetes was the least known risk factor of heart attack.[13] Yadav *et al*. in their study on school students in 2012 in Kathmandu, Nepal, observed that the maximally known risk factor of heart disease (92%) was tobacco chewing/smoking and old age was the least known risk factor (52.8%).[14] George *et al*. in 2012 in Delhi observed that the maximally known risk factor of heart diseases was stress for long periods as reported by 76% of students and the least known risk factor was family history of heart diseases as reported by 40% of students.[8]

In our study, 10% of students in school 1 and 61.7% of students in school 2 had satisfactory knowledge (>50% score) about heart disease before the intervention. In a study conducted by Ramya *et al*. in 2014 in Kerala, the authors found that about 26% of students scored 50%–75% regarding the awareness of CHD and the mean percentage score was 44.3%.[13] This study has found lower awareness because of different

study settings. In a study conducted by George *et al*. in 2012 in an urban area of Delhi, 79% of students had score >50% and 21% had inadequate knowledge scores (<50%).[8] The difference may be due to urban–rural variation in the knowledge of students. In a study conducted by Ade *et al*. in 2012 in Karnataka, 76.2% of the students had low awareness of NCDs (knew up to three risk factors), 23.5% of the students had medium awareness (knew up to 4–7 risk factors of NCDs), and only 3% had good knowledge (knew up to 8–11 risk factors of NCDs).[15] Similarly, in a study conducted by Divakaran *et al*. in 2013 in Kerala, 0.8% of the students had high score (>60% of maximum score) and 84.8% of the students had poor score (<30% of maximum score),[11] which is quite lower than the present study and may be due to the different study setting. In our study, the proportion of students with satisfactory level of knowledge of heart attack increased after 2 weeks as well as after 3 months of intervention in both school 1 and school 2, and the difference was statistically significant ($P < 0.05$). The results of the study conducted by Shah *et al*. in 2010 in three cities of North India (New Delhi, Jaipur, and Agra) were similar to those of our study where knowledge about CVDs increased from baseline to 6 months after the MARG (Medical education for children/adolescents for Realistic prevention of obesity and Diabetes and for healthy aGeing) intervention among children of age group 8–18 years.[16] In another interventional study conducted by Ray *et al*. in 2014, the mean score of knowledge of CVDs increased significantly at posttest done immediately after the educational intervention.[17]

In our study, 14.2% of the students in school 1 and 9.2% of the students in school 2 had heard of stroke. In a study conducted by Thapa *et al*. in 2013 in Nepal, 71.1% of the students had heard or read about stroke.[18] The reason may be inclusion of high school students in their study. In a study conducted by Farooq *et al*. in 2012 among high school students of both government and private schools of Pakistan where information was elicited by interview method, 89% of the students had heard of stroke.[19] Our study found lower awareness among participants partly because of inclusion of only government schools in our study and also difference in the method of data collection. In our study, from school 1, majority of the students knew dietary factors as the risk factors, whereas from school 2, majority of the students knew smoking, HTN, and increased cholesterol as the risk factors of stroke. In the study conducted by Thapa *et al*. in Nepal, HTN was the most common risk factor identified among students.[18] In a study conducted by Obembe *et al*. in 2013 among students of Obafemi Awolwo University, Nigeria, HTN was the most commonly known stroke risk factor as reported by 83.2% of the students.[20] The current research has an interventional study design, which is its main strength. Two different interventions were done in the two arms of the study, which further adds to the strength of the study. Interventions were given a total of three times for the reinforcement of the knowledge in both the arms. The postintervention data were collected at two points of time, i.e., at 2 weeks and 3 months after the intervention. The study has scientific methodology of calculation of sample size and selectionof participants. There is a high adherence of study participants at pretest and 2 weeks of follow-up after the intervention. A 10% of the extra study participants were included in the study to account for the attrition. A pretested, predesigned, and validated questionnaire was used for the study. The IEC material was designed and prepared by the institutions of national repute and were also pretested.

The study was conducted in only two government schools of Delhi and hence the results cannot be generalized to the students studying in other types of schools. Because it was a questionnaire-based study, recall bias leading to inaccurate or incomplete reporting by the students cannot be ruled out. Although the two schools selected were physically located at a distance from each other, a possibility of some contamination may not be ruled out.

This study is among the few studies done in India among school-going adolescents in which health literacy (basic) of CVDs has been assessed and educational intervention has been done in two different forms in two schools to assess change in the awareness of students regarding CVDs as compared to baseline at two different times (at 2 weeks and 3 months) over a period of 4 months. The interventions were repeated two more times (total three times) at monthly intervals for reinforcement.

Conclusions and Recommendations

In this study, though most of the students have heard of CVDs like heart attack and stroke but they lack specific information regarding their risk factors, preventive and treatment measures.However, most of them do not know what is stroke. There has been a significant improvement in the knowledge of both heart attack and stroke among students of the schools after different forms of IEC activities. Thus, IEC in the form of posters, pamphlets, and lecture may help in improving school-going adolescents' knowledge regarding CVDs. In this study, only basic level of health literacy, i.e., knowledge has been assessed. The higher levels of health literacy, i.e., communicative and critical health literacy, also need to be assessed through further studies. Further research on whether improving health literacy is effective in changing the health behavior and decreasing the risk

of disease among school-going adolescents needs to be done.

Acknowledgment

The authors wish to thank the Institutional Ethics Committee of VMMC and Safdarjung Hospital, New Delhi, for approving the topic of this study. We also express our gratitude to the school teachers for helping us in conducting the study and students who participated in the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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