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Assessing Nutritional Status Index of Anganwadi Children Attending ICDS (Integrated Child Development Services) Centres: A Study in Trivandrum District, Kerala

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Abstract

Introduction: In pursuance to the national policy of children in 2nd Oct 1975 GOI initiated a National Programme: Integrated Child Development Services (ICDS) to improve the health, nutrition and overall development of children among the deprived population of 33 blocks (including 4 rural, 18 urban and 11 tribal blocks) through network of AWC in India.

Objective: To formulate and analyse the nutrition status index of anganwadi children attending ICDS centres in Trivandrum district.

Methodology: The present study was conducted in Trivandrum Urban Project II, (sector I and IV) selected randomly in Thiruvananthapuram district, Kerala, India. 90 anganwadi children (in the age group of 2-6 years) were selected randomly from the two sectors. Weight, height, skin fold thickness, head circumference, chest circumference, and waist circumference were taken. Nutritional status of each child was calculated using selected anthropometric measurements by formulating a specific formula. Scoring was given for each variable according to the standard values considering both age and gender of the children.



Results: Majority of children (50%) were included under normal range with NSI values above 400. Children with less than minimum weight and height requirement need attention.

Conclusion: Present study reveals that there is a need to improve the nutritional status of children attending anganwadi. Mothers and anganwadi workers should be made aware of the significance of nutrition among children

Keywords: ICDS, Anganwadi children, Nutrition status, Weight, Height, SFT, Head, Chest, Waist, and mid upper arm circumference.

1. Introduction

Children hold the future of our nation. Child welfare reflects how a country protects and nourishes its vulnerable members. Globally indicators of children's well-being are used to know the developmental status of different countries, such as in the Human Development Index or the Millennium Development Goals [1]. A person's childhood is the most important part of a person's life. It is a foundation for his character. It influence his whole future, his career, his attitude, his action and his belief [2].

India holds the largest child population in the world. Children under six years of age make up nearly 20% of India's population [3]. Nutrition Intervention Programmes aimed at provision of food or nutrients directly to people who are at risk of developing malnutrition are pursued by health and social welfare sectors in many developing countries including India [4].

In pursuance to the national policy of children in 2nd Oct 1975 GOI initiated a National Programme: Integrated Child Development Services (ICDS) to improve the health, nutrition and overall development of children among the deprived population of 33 blocks (including 4 rural, 18 urban and 11 tribal blocks) through network of AWC in India [5].

Kerala has an excellent record in woman and child development. ICDS started in the year 1975-76. There was a steady growth of the implementation of ICDS [6]. The objectives of ICDS are a) to improve the nutritional and health status of children under six, b) to lay the foundation for the proper psychological, physical and social development for the child, c) to reduce the incidence of mortality, morbidity, malnutrition and school dropout, d) to achieve effective coordination of policy and implementation among the various departments promoting child development and f) to impart proper nutrition and health education among children [7].

In this study an effort has been made to see how far these objectives were attained by assuming the Nutrition Status Index of each children under the study population.

2. Methodology

2.1. Selection of Area

The present study was conducted in Trivandrum Urban Project II. 175 anganwadi centres are there in this project which is further subdivided into five sectors like the other three project sectors such



as Urban I, III, & V. Among the five sectors under the urban project no: II, sector I and IV was selected randomly.

2.2. Plan of Action

In order to achieve the objectives, following action programmes were envisaged and conducted.

- a. Collected details of children such as height, weight, skin fold thickness, head circumference, chest circumference and waist circumference of children selected randomly for study.
- b. Scoring was given to each children according to their anthropometric measurements.

2.3. Selection of Samples

90 preschool children (in the age group of 2-6 years) were selected randomly from the two sectors under the urban project centre II for assessing the nutritional status index of children.

2.4. Selection of Methods of Study

The nutrition status of preschool children were assessed using standard techniques of anthropometry. Weight, height, skin fold thickness, head circumference, chest circumference, and waist circumference were taken under anthropometric measurements.

WHO (2005) reported that weight for age and height for age of a child are helpful in reflecting the long term health and nutritional status of the population. To measure the prevalence of malnutrition in children anthropometric indicators like height for age and weight for age are highly significant.

2.5. Scoring

Nutrition Status Index

Nutritional status of each child was calculated using selected anthropometric measurements and clinical assessment schedule. Scoring was given for each variable according to the standard values considering both age and gender of the children.

Height and weight scales were given as 3 for medium height, 2 for minimum scale and 1 for less than minimum height standards according to IAP and WHO. Skin fold thickness was given as 3 for average values, 2 for ideal values and 1 for lean children. Ideal head circumference for children according to WHO (2010) is 45.5- 51cm. Hence those this value range was given a score of 2 and less than 45.5 were given a score of 1. Head circumference greater than chest circumference is a sign of malnutrition. Those who are having head circumference less than chest circumference was given as 2 and a score of 1 for the other children. Waist circumference greater than equal to curve reference values given a score of 2 and less than that given with a score of 1. Mid Upper Arm Circumference scales were given as 3, 2, 1 according to normal, at risk, and moderate values. Nutritional status of individuals were found using the formula given below

$$NSI=W*WS+H*HS+SFT*SFTS*HC*HCS+CC*CCS+WC*WCS+MUAC*MUA CS$$



W- Weight, WS- Weight Score

H- Height, HS- Height Score

SFT- Skin Fold Thickness, SFTS- Skin Fold Thickness Score

HC- Head Circumference, HCS- Head Circumference Score

CC- Chest Circumference, CCS- Chest Circumference Score

WC- Waist Circumference, WCS- Waist Circumference Score

MUAC- Mid Upper Arm Circumference, MUACS- Mid Upper Arm Circumference Score

3. Results

Table 1. Distribution of anganwadi children according to their height, weight and skin fold thickness along with their scores gained.

	Age	Gender	Height	SH	Weight	SW	SFT (mm)	S SFT
1	2	M	1	3	9	2	13	2
2	2.5	M	1.1	3	12.5	3	9	1
3	2	M	0.8	1	9	1	10	2
4	2	M	0.9	2	8	1	10.5	2
5	2	M	1.01	3	9.9	2	9.5	1
6	3	M	0.92	2	11	2	11	2
7	3	M	1.12	3	14	3	11.5	2
8	3	M	1.1	3	14	3	11	2
9	3	M	0.99	3	13	2	10.5	2
10	3	M	0.92	2	15	3	11	2
11	3	M	0.95	2	15	3	10.8	2
12	3	M	0.97	3	13	2	10.5	2
13	3	M	0.86	1	9	1	8	1
14	3	M	0.84	1	9	1	8	1
15	3	M	0.91	3	13.1	2	8.5	1
16	2	F	0.92	3	13	3	9.5	1
17	2	F	0.85	2	10.5	3	10	2
18	2	F	0.9	3	12	3	8.5	1
19	2	F	1.06	3	7	1	11	2
20	2.5	F	0.92	3	16	3	11	1
21	2.5	F	0.85	2	10	2	10.5	2
22	2.5	F	1.1	3	11	2	9.5	1
23	2.11	F	0.85	2	10.7	2	10.5	2
24	3	F	1.08	3	11	2	10	2
25	3	F	0.97	3	9	1	9	1
26	3	F	0.93	2	14	3	9	1
27	3	F	0.99	3	9	1	9.5	1
28	3	F	0.92	2	11	2	10.5	2
29	3	F	1.05	3	13	2	11	2
30	3	F	0.89	3	12.7	2	8.5	1
31	3.5	M	1.03	3	13	2	8	1
32	3.5	M	0.93	2	13.5	2	10	2
33	3.5	M	1.09	3	8.5	1	8.5	1
34	3.11	M	1.05	2	15	2	11.5	2



35	4	M	1.01	3	10	1	6	1
36	4	M	0.94	1	15.7	2	12.5	2
37	4	M	0.97	2	13.3	2	12.5	2
38	4	M	0.86	1	10	1	9	1
39	4	M	1.04	3	13	2	12.5	2
40	4	M	1.04	2	15.7	3	11	2
41	4	M	0.96	2	18	3	13	2
42	4	M	1.05	3	13	2	12	2
43	3.75	F	0.89	1	10.8	1	10	2
44	3.5	F	1.02	3	15	3	8	1
45	3.5	F	1.01	3	14	2	6	1
46	3.7	F	1	3	15	3	10.5	2
47	3.5	F	1.05	3	12	2	9	1
48	3.5	F	0.88	1	9	1	8.5	1
49	4	F	1.01	3	14	2	10.5	2
50	4	F	0.99	2	12.5	2	10	2
51	4	F	1.02	3	14	2	12	2
52	4	F	1.01	3	13.8	2	16	3
53	4	F	0.94	1	15.8	3	12	2
54	4	F	1.07	3	16	3	12.5	2
55	4	F	0.9	1	11	1	11.5	2
56	4	F	1.03	3	11	1	10	2
57	4	F	1.09	3	13	2	7	1
58	4	F	1.08	3	12	1	10.5	2
59	4.5	M	1.01	2	15.8	2	10	2
60	4.5	M	0.88	1	13	2	12	2
61	5	M	1.05	3	12.5	1	12	2
62	5	M	1.09	3	14.5	2	8	1
63	5	M	1.09	3	19	3	9	1
64	5	M	1.07	2	18	3	9.5	1
65	5	M	0.9	1	18	3	20	3
66	5	M	1	2	20	3	18	3
67	5	M	1	2	22	3	18.5	3
68	5	M	1.05	2	13	1	13	2
69	5	M	1.05	2	15	2	17	3
70	5	M	1.03	2	15.2	2	18	3
71	4.5	F	1.04	2	14.5	2	10	2
72	4.5	F	1	2	16.1	2	10	2
73	5	F	0.91	1	10	1	8	1
74	5	F	0.99	2	15.5	2	20	3
75	5	F	1.005	3	18	3	16	3
76	5	F	1.09	3	16	2	12	2
77	5	F	1.12	3	20	3	12.5	2
78	5	F	1.1	3	15	2	9.5	1
79	5	F	1	2	18	3	12.5	2
80	5	F	1.05	2	17	3	12.5	2
81	5	F	1.1	3	15	2	13	3
82	5	F	1.05	2	14	2	12	2
83	5	F	1.07	2	14	2	13	2
84	5	F	1.05	2	15	2	10	1
85	5	F	0.93	1	14	2	11	2
86	5	F	1.02	2	14.9	2	10.5	2
87	5.5	M	1.08	2	17	2	20	3
88	5.5	M	1.09	3	20	3	21	3
89	6	M	1.1	1	16	2	20.5	3
90	6	M	1.14	2	20	2	21	3



Height Scale	Weight Scale	SFT score
Medium 3	Medium 3	Average 3
Minimum 2	Minimum 2	Ideal 2
< Minimum 1	< Minimum 1	Lean 1

As revealed in the table 1, 83 per cent (75) children were having minimum and greater than minimum height requirements. 80 per cent (72) children were having greater than and equal to minimum weight requirements. 70 per cent (63) children were having their skin fold thickness greater than 10 mm.

Table 2. Distribution of Anganwadi Children according to their Head, Chest, Mid Upper Arm and Waist Circumference along with their Scores Gained

	HC	S HC	CC	S CC	MUAC	S MUAC	WC	S WC
1	49	2	50.5	2	13	2	49.5	2
2	46.5	2	48	2	12	1	48.5	2
3	47	2	47.5	2	12.5	2	49	2
4	48.5	2	49	2	13.5	2	49.5	2
5	49	2	50.5	2	12.8	2	49.5	2
6	49	2	51	2	14.8	3	51.5	2
7	49.5	2	51	2	15.5	3	52	2
8	50	2	50.5	2	14.5	3	46.5	1
9	50.5	2	51	2	14	3	48	1
10	51	2	51.5	2	13.5	2	49.5	2
11	50.5	2	51	2	12.5	2	48	1
12	49.5	2	51	2	13	2	48.5	1
13	49	2	49	1	12	1	47	2
14	49	2	49.5	2	12.5	2	48	2
15	49	2	48.5	2	11	1	47.5	2
16	49.5	2	50.5	2	13	2	48.5	2
17	50	2	51	2	13.5	2	49.5	2
18	50.5	2	51.5	2	13	2	50	2
19	48.5	2	49.5	2	12	1	47.5	2
20	49	2	49.5	2	12.5	2	48	2
21	50	2	50.5	2	12	1	50	2
22	48.5	2	53	2	16	3	50	2
23	49	2	49.5	2	14	3	49.5	1
24	50	2	52	2	14	3	50	2
25	50.5	2	52	2	15	3	49	2
26	50	2	52.5	2	14	3	50.5	2
27	47	2	48	2	14	3	45	1
28	48	2	48.5	2	16.5	3	48.5	2
29	49	2	46	1	14	3	46	1
30	54	2	53.5	1	15.5	3	53	2
31	48.5	2	53	2	16	3	50	2
32	49	2	51.5	2	17	3	50	2
33	48	2	49	2	15.5	3	50	2
34	45.5	2	47.5	2	16.5	3	46.5	1
35	48.5	2	53.5	2	17	3	51.5	2
36	47	2	52.5	2	13	2	51.5	2



37	51	2	53	2	15	3	51	2
38	51	2	53.5	2	16	3	52	2
39	49	2	52	2	16	3	50	2
40	48.5	2	49	2	13	2	49.5	2
41	50	2	50.5	2	13.5	2	48.5	1
42	48.5	2	49.5	2	16	3	46.5	1
43	46	2	49	2	16	3	49	2
44	49	2	51.5	2	16	3	53	2
45	55	2	53	1	15	3	49	1
46	49	2	50.5	2	16.5	3	50	2
47	52	2	53.5	2	16.5	3	51	2
48	48.5	2	49	2	12	1	52	2
49	52	2	53.5	2	16	3	51	2
50	52.5		54	2	16	3	51.5	2
51	51.5		52	2	14	3	51	2
52	50		50.5	2	13.5	2	49.5	1
53	48.5		49.5	2	16	3	49	1
54	49		49.5	2	14	3	51.5	2
55	52		53.5	2	16.5	3	51	2
56	47		49	2	17	3	49	1
57	50		53	2	17.5	3	51	2
58	50	2	52	2	16	3	51.5	2
59	50	2	53	2	16.5	3	50.5	1
60	50	2	53	2	16.5	3	52	2
61	50.5	2	52	2	15.5	3	50.5	2
62	52	2	55	2	17.5	3	52	2
63	51.5	2	52	2	14.5	3	50	1
64	49.5	2	52	2	15	3	53.5	2
65	50	2	46	1	12.5	2	53	1
66	49	2	55	2	17.5	3	55.5	2
67	51.5	2	56	2	19	3	55	2
68	51.5	2	52	2	14.5	3	52.5	1
69	52	2	54	2	15	3	53.5	2
70	49.5	2	52	2	16	3	54	2
71	52	2	54	2	16.5	3	56	2
72	51.5	2	53.5	2	16.5	3	54	2
73	52	2	54.5	2	17	3	51	1
74	51.5	2	53	2	16.5	3	54	2
75	52.5	2	54	2	16	3	51.5	1
76	50	2	52	2	16	3	53	1
77	52	2	53.5	2	17	3	54.5	2
78	52.5	2	55	2	16	3	52.5	1
79	50	2	47	1	13.5	2	54	2
80	51	2	53	2	14	3	52	1
81	50	2	55	2	17.5	3	55.5	2
82	52	2	55	2	17	3	54.5	2
83	54	2	56	2	18	3	55	2
84	53	2	55	2	17.5	3	55	2
85	54	2	56.5	2	18	3	56	2
86	54	2	56	2	17.5	3	54	2
87	52	2	54	2	18	3	55	2
88	54	2	56	2	18.5	3	56	2
89	55	2	57.5	2	19.5	3	57	2
90	57	2	60	2	20	3	59	2



Head Circumference Score: $45.5-51= 2$; $< 45.5= 1$

Chest Circumference Scale: $HC<CC= 2$; $CC>HC= 1$

Waist Circumference: \geq Std Value= 2; $<$ Std Value 1

MUAC Scale: Normal 3, at risk 2 Moderate 1 Severe 0

As revealed in the table 2, 93 per cent (84) children were having head circumference less than their chest circumference. According to the measure of mid upper arm circumference measures 4 children were having moderate levels of malnutrition. All of the study population were having their standard and required head circumference. 23 children were having their waist circumference less than the standard values.

Table 3. Nutritional Status Index of Anganwadi Children

Sl no.	NSI	Mean value (406.15) SD
1	390	16.15
2	366.8	39.35
3	360.8	45.35
4	369.8	36.35
5	374.93	31.22
6	412.24	-6.09
7	438.86	-32.71
8	377.3	28.85
9	361.97	44.18
10	418.84	-12.69
11	363.5	42.65
12	344.41	61.74
13	323.26	82.89
14	390.2	15.95
15	367.2	38.95
16	373.18	32.97
17	408.76	-2.61
18	391.7	14.45
19	356.8	49.35
20	381.1	25.05
21	377.24	28.91
22	390.91	15.24
23	360.36	45.79
24	386.47	19.68
25	411.84	-5.69
26	418.15	-12
27	313.86	92.29
28	395.07	11.08
29	268.84	137.31
30	370.43	35.72
31	407.09	-0.94
32	419.86	-13.71
33	379.77	26.38
34	332.69	73.46
35	433.06	-26.91
36	384.03	22.12
37	443	-36.85
38	435.1	-28.95



39	405.15	1
40	357.38	48.77
41	316.03	90.12
42	361.53	44.62
43	400.98	5.17
44	429.06	-22.91
45	352.63	53.52
46	439.84	-33.69
47	438.84	-32.69
48	383.54	22.61
49	456.21	-50.06
50	417.9	-11.75
51	404.09	2.06
52	334.77	71.38
53	348.24	57.91
54	380.86	25.29
55	435.62	-29.47
56	382.18	23.97
57	461.42	-55.27
58	427.15	-21
59	377.62	28.53
60	429.58	-23.43
61	425.7	-19.55
62	440.38	-34.23
63	359.15	47
64	413.27	-7.12
65	261.91	144.24
66	482.48	-76.33
67	506.015	-99.865
68	381.27	24.88
69	471.36	-65.21
70	420.8	-14.65
71	473.5	-67.35
72	464.6	-58.45
73	406.3	-0.15
74	439.6	-33.45
75	387.64	18.51
76	366.1	40.05
77	440.93	-34.78
78	387.34	18.81
79	370.27	35.88
80	386.64	19.51
81	507.4	-101.25
82	509	-102.85
83	526.5	-120.35
84	438.6	-32.45
85	489.1	-82.95
86	485.96	-79.81
87	491.16	-85.01
88	532.77	-126.62
89	511.1	-104.95
90	536.28	-130.13

Table 3, depicts the nutritional status index of children calculated using the formula mentioned earlier. Average value of NSI for the 90 children was find as 406. 49% of children were above the average values of nutrition status index.

According to the NSI value ranges they were classified into three categories namely normal, moderate and at risk.



Table 4. Shows the percentage distribution of anganwadi children according to their NSI values

Table 4. Distribution of Children according to their NSI

NSI range	No of children
Normal (>400)	45 (50.00)
Moderate (300-400)	43 (47.80)
At risk <300	2 (2.20)

Values in parenthesis indicates percentage

Results of the table 4, indicates that majority of children (50%) were included under normal range with NSI values above 400. 47.8% of children are in the moderate category in the NSI range of 300-400. In the category of at-risk that is less than 300 NSI values 2.2% of children were present.

Correlation between NSI and other Variables

Table 5 depicts the correlation of Nutrition Status Index with various variables.

Table 5. Correlation between NSI and Variable

	NSI
NSI	1
Age	.52
Height	.30
Weight	.69
SFT (mm)	.77
HC	.56
CC	.81
MUAC	.73
WC	.76
CA	.13
BMI	.49
Ordnl pstn	.12
Birth weight	.28
HC	.74

As revealed in the table 5, Skin fold thickness (.77), Mid Upper Arm Circumference (.73), Waist Circumference (.76) and Head Circumference (.74) were strongly correlated with the Nutritional Status Index of children.



Figure 1. Correlation between NSI and other Variables

4. Discussion

Height, weight, skin fold thickness and mid upper arm circumference are significant anthropometric measurements for assessment of nutritional status. Additional measurements such as head circumference and chest circumference are taken for young children [9].

Height of the study population were collected and were compared with the height for age according to the table put forward by WHO and IAP in 2015. Accordingly they were classified as medium height, minimum height and less than minimum height. 15 children in the study population were having less than their height requirements.

Weight of the study population collected were classified according to the age for weight table proposed by Indian Paediatric Association and World Health Organization. Study population were having only up to the maximum values of medium weight requirements and hence total sample was classified mainly into three categories medium weight, minimum weight and less than minimum weight. 18 children in the study population were having less than the minimum height. More than 80 %anganwadi children are having their required weight and height standards. Similar to this results of study conducted by NIPCC (2008), in Trivandrum district 78% of the children were included under the normal category.

According to Sreelakshmi (2018), serial measurements of weight and height in growth monitoring are more sensitive indicators of changes in nutritional status than a single measurement at a point of time. Skin fold thickness of children were calculated to find the presence of malnourishment. It is a means of assessing the amount of fat in an individual. Value less than 10 mm is an indication of malnutrition.



Majority of children have their skinfold thickness measurements greater than 10 mm, even though 27 of the study population were having less than 10 mm.

In order to identify the mortality risk associated with malnutrition Mid Upper Arm Circumference is considered as a better indicator than weight for height. Children below 11cm indicates severe malnutrition, 11cm-12.5cm indicates moderate acute malnutrition, and 12.5-13.5cm indicates at risk of acute malnutrition and 13.5cm are well nourished child [12].

Accordingly 5 children (3 girls and 2 boys) were under the category of moderate malnutrition. Head circumference and chest circumference of children were also collected. The chest in a normally nourished child grows faster than head during the second and third years of life. Hence children are classified accordingly, those who are having head circumference less than chest circumference and chest circumference less than chest circumference. 6 children in the study population were having their chest circumference less than head circumference.

According to the NSI values study population were classified into three categories as normal, moderate, and at risk group. Half of the study population were included under normal category with a NSI value greater than 400.

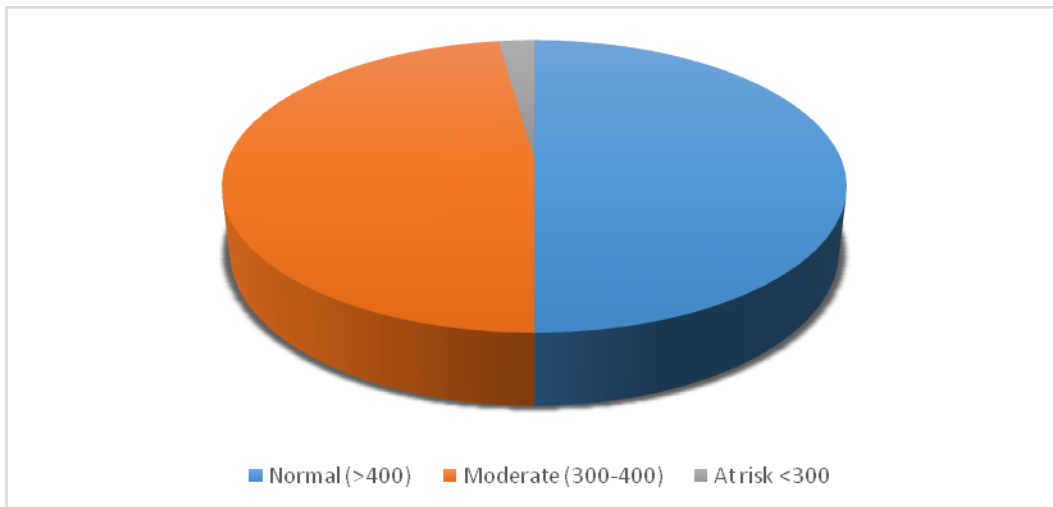


Figure 2. NSI Range of the Study Population

A similar study conducted by Alim and Jahan (2012) shown that majority of children who were attending anganwadi centres were having normal nutrition status.

5. Conclusion

Weight for age and height for age represents past and present nutritional status. It can also reflect health and nutritional experience of the study population. Children having less than their minimum height and weight requirements requires special attention.



A nation's children are its supremely important asset and the nation's future lies in their proper development. An investment in children is needed an investment in the Nation's Future. A healthy and educated child of today is the active and intelligent child of tomorrow. So they should be well-nourished.

Present study reveals that there is a need to improve the nutritional status of children attending anganwadi. Mothers and anganwadi workers should be made aware of the significance of nutrition among children and need to be monitored properly in order to find the deviation. It may be signs of malnutrition. A healthy and educated child of today is the active and intelligent child of tomorrow. So they should be well-nourished. It is the duty of the government an every citizen.

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