Journal of Global Public Health (JGPH)

Printed at
Saujanya Printing Press
B-303, Okhla Industrial Area
Phase-1, New Delhi.

Corresponding address
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Journal of Global Public Health (JGPH)

Volume 1 Number 1
January - June 2019

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Evolution: Mankind with Microbes

Manjushree L. Arlikar[1], Purushottam A. Giri[2]

Author's Affiliation: [1]Assistant Professor, Department of Microbiology, [2]Professor and Head, Department of Community Medicine, Indian Institute of Medical Science and Research Medical College, Badnapur, Jalna, Maharashtra 431202, India.

Corresponding Author: Purushottam A. Giri, Professor and Head, Department of Community Medicine, Indian Institute of Medical Science and Research Medical College, Badnapur, Jalna, Maharashtra 431202, India.

E-mail: doctormanjushree@gmail.com

Received on 15.05.2019; **Accepted on** 28.06.2019

How to cite this article:
Manjushree L. Arlikar, Purushottam A. Giri. Evolution: Mankind with Microbes. Journal of Global Public Health. 2019;1(1):5-.

Dear Sir,

"Nothing in Biology Makes Sense Except in the Light of Evolution"

Today the foundation of the neo-Darwinian synthesis that Dobzhansky helped engineer has grown into one of the central pillars of modern biology and underlines the essentiality of considering biological processes from an evolutionary viewpoint [1]. Mankind and microbes have coexisted in competitive equilibrium since long before recorded history. Every part of the body in contact with the environment possesses a thriving population of bacteria that normally cause no harm. About 100 thousand billion bacteria live in or on the average adult human [2]. In fact, microbial cells outnumber human's own cells. The collective genome of the microbiota, the 'microbiome', contains 100–150 times as many genes as the human genome [3]. The microbiome plays important roles in multiple core aspects of human biology, including digestion and energy metabolism, immune development, neurological function and infectious disease susceptibility [4]. In spite of this, humans are always at risk for the various fatal and non-fatal infections; sometimes sporadic, sometimes causing many people to suffer in epidemics and in devastating pandemics. Outbreaks of influenza, plague, cholera are some of the examples from the history. It was much difficult at that time to control morbidity and deaths due to these infections. But in recent times, we have evolved much by the extensive research in pharmacology. Discovery of antimicrobial drugs revolutionized the modern medicine. Vaccination gave novel approach to use microbes and their products to develop immunity against them. Implementation of public health measures like pasteurization of milk, purification of water, hand hygiene, avoidance of high risk behaviour significantly decreased burden of infections on humanity. Unfortunately, shortly after the clinical introduction of antibiotics, microbial resistance began to appear in literature [2].

Nowadays, multidrug resistant organisms like MRSA, ESBLs, XDR-TB etc. are emerging which proves that microbes are evolving fast for their survival. Our irrational use of antibiotics not only in human disease but also in agriculture, veterinarian and industrial area is also responsible for this resistance problem up to much extent. Of course, as like we humans are evolving to face the microbial disasters, the microbes also evolve to face the antibiotic disaster. It was never

surprising, it rather rationalize the situations in which the survival of the fittest microbe is obvious. Their various ways to inactivate antibiotics are inactivation through enzymatic attack, enhanced production of target enzymes, self-modification of pathways & structures, decrease in uptake and increase in expulsion of drugs and many more. The diversity of these modes makes finding a universal solution to the resistance problem extremely difficult. Moreover, rapidity with which bacteria reproduce is an important factor in their evolution. This growth rate makes them adjust much more rapidly to threatening changes in environment than mankind [2].

Considering all these aspects, battle with them by using these armours will not be fruitful in long term. Along with implementing antibiotic stewardship, we need new approaches. Coexistence with them rather than competitive existence with them will solve the problems to some extent. Research on the factors responsible for disturbing the co-equilibrium between man and microbe might be fruitful. The human microbiome is recognized as a powerful vector for therapeutic interventions because it is easily manipulated and highly responsive. Moreover, in addition to playing an important role in maintaining general health, the microbiome also impacts drug efficacy and the effectiveness of chemotherapy treatments [4]. Human microbiome project is a big step towards this new approach which will invent a lot of novel unforeseen approaches [5].

New approaches in developing good immunity at early life stages are needed so that from the beginning of life, we establish good coexistence with microbes. Vaccination, probiotic intake and hygiene hypothesis [6] are some of the approaches regarding that. Many unforeseen approaches we can search on for this. Refining our gene pool by various modern genetic technologies will also be the revolutionary approach. Many researches are on-going for modifying our immune cells, and stem cells. Survival of the fittest is the only evolutionary mechanism in microbes. But we, mankind as most intelligent species can study, research, explore and develop new approaches for the survival. But, as we know microbial cells on our body outnumber our own cells, research on modifying the gene pool of our "friend" microbe to combat with our "enemy" microbe will be better option to face these problems. We can let their evolution help in our evolution. We can make them produce good products for us to kill or to rather modify their notorious friends. As like in the history, war will be beneficial neither to mankind nor to microbes. This war will never cease. To deal with this, microbiologists', molecular biologists', evolutionary biologists' and biotechnologists' collaboration and intensive exploration of co-evolution of man and microbe is the need of time.

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Effectiveness of Beetroot Juice with Lemon and Beetroot Juice without Lemon on Anemia among Adolescent Girls

Manveen Kaur Chhabra[1], Hardeep Kaur Mal[2], Mandeep Kaur[3]

Author's Affiliation: [1]Ex. PG Student, [3]Lecturer, [2]Professor and Head, Community Health Nursing, University College of Nursing (UCON), Baba Farid University of Health Sciences, Faridkot, Punjab 151203, India.

Corresponding Author: Hardeep Kaur Mal, Professor and Head, Community Health Nursing, University College of Nursing (UCON), Baba Farid University of Health Sciences, Faridkot, Punjab 151203, India.

E-mail: hardeepmal@gmail.com

Received on 19.05.2019; **Accepted on** 22.06.2019

How to cite this article:

Manveen Kaur Chhabra, Hardeep Kaur Mal, Mandeep Kaur. Effectiveness of Beetroot Juice with Lemon and Beetroot Juice without Lemon on Anemia among Adolescent Girls. Journal of Global Public Health. 2019;1(1):7-13.

Abstract

Introduction: Anemia is most prevalent nutritional problem worldwide and it is mainly caused by iron deficiency**.** Iron is very necessary for many functions in the body including formation of haemglobin, brain development and function, regulation of body temperature, muscle activity and catecholamine metabolism. Lack of iron in blood directly affect immune system, diminishes the number of T-cells and the production of antibodies. Along with the pharmacological therapy, many complementary therapies are also available for treating anemia. Similarly consuming beetroot juice or beet as cooked vegetable in salad is highly beneficial in treating anemia.

Aim of the study: To assess the effectiveness of beetroot juice with lemon and beetroot juice without lemon on anemia among adolescent girls at selected Senior Secondary School, Faridkot.

Material and methods: A quantitative approach with and quasi experimental, pre test-post test research design was selected for the present study. With simple random sampling (60) anemic adolescent girls were selected having Hb value of 9-11 gm/dl. Out of 60 selected anemic adolescent girls, random allocation was done by slip method and 30 each were assigned to experimental group 1 and experiment group 2. Socio demographic data sheet and Hb record sheet was prepared to assess the effectiveness of beetroot juice with lemon and beetroot juice without lemon on anemia among adolescent girls.

Results: Both interventions i.e. beetroot juice with lemon and beetroot juice without lemon were helpful in improving Hb among adolescent girls but comparison of these interventions showed post intervention mean score of beetroot juice with lemon was 11.73 and mean of beetroot juice without lemon was 11.26 which were significant at p value <0.05**.**

Conclusion: Beetroot juice with lemon is an effective intervention to raise the level of Hb and improve the absorption of iron. Adolescent girls can prepare it themselves and the cost is low when compared with other iron rich vegetables.

Keywords Beetroot juice with lemon; Beetroot juice without lemon; Anemia; Adolescent girls.

Introduction

In India, adolescent girls, who constitute a sizeable segment of its population for a vulnerable group and are at greater risk of morbidity and mortality [1]. Adolescent girls are at risk for anemia and malnutrition. Inadequate nutrition during adolescence can have serious consequences throughout the reproductive years of life and beyond. The word adolescence is derived from the latin word, 'adolescere';

meaning "to grow, to mature [2]. Adolescence has been defined by World Health Organization as a period of life spanning the ages between 10-19 years [3]. India's population has reached the 1 billion mark, out of which 21% are adolescents. About 30% of India's population is in age group 10-19 years [4]. Anemia is most prevalent nutritional problem worldwide and it is mainly caused by iron deficiency. Anemia not only affects the present health status of girls but also has deleterious effects in future pregnancy, that puts the women at three times greater risk of delivering low birth weight and nine times higher risk of prenatal mortality, thus contributing significantly for increased infant mortality rate and 30% maternal deaths. The prevalence of anemia is disproportionately high in developing countries, due to poverty, inadequate diet, worm infestation, pregnancy/lactation, poor access to health services [5].

Anemia is a clinical condition that results from an insufficient supply of healthy red blood cells (RBCs) the volume of packed RBC's and/or the quantity of hemoglobin. Hypoxia results because the body's tissues are not adequately oxygenated. Manifestations accompanying anemia are due to the body's response to hypoxia. Haemoglobin (Hb) levels are used to determine the severity of anemia. Client with mild anemia (Hb level of 10-11g/dl) are often asymptomatic. If manifestations do occur, they typically follow strenuous exertion. Clients with moderate (Hb level 6-10g/dl) may suffer from dyspnea, palpitation, diaphoresis with exertion, and chronic fatigue. Some clients with severe anemia (Hb level <6g/dl) such as those with chronic renal failure, may be asymptomatic because their anemia develops gradually [6].

Medical Management includes oxygen therapy, Erythropoietin, Iron Replacement. The oral form of iron should be used because it is inexpensive and convenient. It is usually given for mild forms of anemia. The medication of choice are ferrous sulphate (Feosol) or Ferrous Gluconate (Fergon), 200 to 325 mg orally in 3-4 divided doses a day, with or after meal. Taking iron with vitamin C aids in absorption of iron [7].

The prevention includes consuming iron rich food, consuming nutritious source of vitamin C in each meal for a better absorption of iron (eg. Orange, grapes, tomato, lime), adding red meat, fish, chicken to one's daily diet, consumption of nuts as dried berries, raisins, daily consumption of an iron tablet from the end of 4th month of pregnancy to 3 months after delivery, consuming iron drops simultaneously with use of supplementary feeding upto the end of 2 years of age among children [8]. Refraining from drinking tea, coffee with or immediately after one's meal, Correction of proper eating habits (consumption of inedible material such as soil or ice) which are symptoms of iron deficiency, Consultation with physician and nutrition therapist for early prevention and treatment [9]. According to H.K Bahru author of 'food that heal', Beetroot juice is particularly beneficial as an anemia remedy for children and teenagers. Easton Patrick (2011) says that consuming beetroot juice or beet as cooked vegetable in salad is highly beneficial in treating anemia. Nirman Walker (2010), in fresh vegetables and fruit juice, claims that beets build red corpuscles and add tones to blood so that it increases haemoglobin level in blood. Many studies proved that beetroot contributes to improve the haemoglobin level in blood. The cost is low when compared with other iron rich vegetables [10].

Also, beetroot is rich in Vitamin A, B1, B2, B6, folic acid, B12 and C. Some of mineral properties are folic acid, Potassium, Calcium, Sodium, Magnesium, Iron, phosphorous and many antioxidants. The benefits of beetroot juice relates mostly to its great reputation as a strong blood builder and purifier because it optimizes the utilization of oxygen stimulating RBC production [11].

Statement of the Problem

A quasi experimental study to assess the effectiveness of beetroot juice with lemon and beetroot juice without lemon on anemia among adolescent girls at selected Senior Secondary Schools, Faridkot.

Objectives of the Study

1. To assess the prevalence of anemia among adolescent girls.
2. To assess the level of Hb of adolescent girls before intervention.
3. To assess the level of Hb after administration of beetroot juice with lemon and beetroot juice without lemon.
4. To find the association of level of Hb with selected socio demographic variables.

Research Hypothesis

H_0: There is no significant difference in post level of Hb between experimental group 1 (Beetroot juice with lemon) and experiment group 2 (Beetroot juice without lemon)

Methodology

Research Approach and Design

Quantitative research approach and quasi experimental study with pre test- post test design was used for the study.

Research setting

The study was conducted in Mahatma Gandhi Memorial School of Faridkot, which is a private co-educational senior secondary school. Majority of the students in this school comes from nearby villages.

Study Population

Adolescent Girls of 12-17 years studying in selected Senior Secondary School, Faridkot.

Sample size and Sampling technique

Sixty (60) anemic adolescent girls having 9-11 gm/dl Hb were selected by Simple Random Sampling (Lottery Method). Random allocation of study subjects was done by slip method and 30 adolescent girls were assigned to each group i.e. experimental group 1 and 2.

Research Tool

The research tool consists of following parts:

Part I: Socio- demographic profile of the respondent: It has total fourteen socio demographic items which were age, class of study, educational status of father, educational status of mother, father's occupation, mother's occupation, family monthly income, religion, residence, dietary pattern, type of family, number of family members, number of siblings and age at menarche.

Part II: Tool to record HB level: This includes a Performa for pre-intervention and post-intervention Hb assessment by using Hb meter.

Part III: Procedure for Hb estimation: Hb assessment of the adolescent girls was done using Hb meter.

Ethical Consideration

Ethical committee of University College of Nursing and Baba Farid University of Health Sciences gave ethical approval for the study to be conducted. Permissions were taken from the school authorities to conduct the study. Apart from this, written informed consents were taken from each study subject and their parents. Confidentiality and privacy of the study subjects was taken care of.

Procedure of Data Collection

Haemoglobin of all the adolescent girls was assessed using Hb meter. Simple Random Sampling (Lottery Method) was used to select study subjects. Random allocation of study subjects was done by slip method and they were assigned to experimental group 1 and experiment group 2. Intervention was given to both the groups. For experimental group 1, fresh beetroot was cut into in to small pieces which were grinded well. Then 30 ml of boiled cool water was added to 30 ml of beetroot pulp and 10 grams sugar with 7-8 drops of lemon was added to the mixture. 60 ml of beetroot juice was given for 20 days between 10-11:30 am once a day to adolescent girls. Similar mixture was prepared without adding lemon and given to adolescent girls of experimental group 2 for 20 days between 10-11:30 am once a day.

Data Analysis: The analysis was done using descriptive statistics like frequency and percentage. Inferential statistics i.e. Paired t-test, Unpaired t-test and Chi Square. S.P.S.S. version 20 was used to analyze the data. p value ≤ 0.05 was considered significant.

Results

Table 1 shows that as per socio demographic variables, both groups were comparable, as chi square value of all variables was found to be non-significant.

Table 2 depicts that less than half i.e. 41.6% of adolescent girls had normal Hb ($\geq$ 12 gm/dl). Slightly more than one third i.e. 36.4% had mild anemia (Hb10-11.9 gm/dl), followed by 19.3% girls had moderate anemia (Hb7-9.9 gm/dl) and remaining 2.8% girls had severe anemia (Hb < 7 gm/dl). Prevalence of anemia among adolescent girls was 58.4%.

Fig. 1 depicts the pre mean level of Hb in both the groups. In experimental group 1, the pre mean level of Hb is 10.21 ± 0.561 and in experiment group 2 it is 10.26 ± 0.650 at df=58, t value=2.98 and p-value=0.76 which is non significant. This means that there is no difference in the pre mean level of Hb in both the groups.

Table 1: Frequency and Percentage distribution of Sample Characteristics N = 60

Variables under study	Experimental Group 1		Experiment Group 2		Total		χ^2
	n	%	n	%	n	%	
Age (in years)							χ^2=1.875
12-14	12	20.0	18	30.0	30	50.0	df=1
15-17	18	30.0	12	20.0	30	50.0	p=0.171
Class of Study							
6th-7th	5	8.3	6	10.0	11	18.3	
8th-9th	15	25.0	14	23.3	29	48.3	χ^2=10.571
10th-11th	8	13.3	7	11.7	15	25.0	df=9
12th	2	3.4	3	5.0	5	8.4	p=0.306
Father's Educational Status							
Illiterate	5	8.3	6	10.0	11	18.3	
Upto Middle	8	13.3	7	11.7	15	25.0	χ^2=7.274
Upto Matric	7	11.7	10	16.6	17	28.3	df=16
Upto Senior Secondary	7	11.7	6	10.0	13	21.7	p=0.968
Graduation and above	3	5.0	1	1.7	4	6.7	
Mother's Educational Status							
Illiterate	13	21.6	7	11.7	20	33.3	
Upto Middle	6	10.0	8	13.4	14	23.4	χ^2=13.252
Upto Matric	5	8.4	10	16.6	15	25.0	df=12
Upto Senior Secondary	4	6.7	5	8.3	9	15.0	p=0.351
Graduation and above	2	3.3	-	-	2	3.3	
Occupation Status of father							
Unemployed	-	-	-	-	-	-	
Self-Employed	13	21.6	7	11.7	20	33.3	
Farmer	1	1.6	1	1.7	2	3.3	χ^2=9.498
Government Service	5	8.4	3	`5.0	8	13.4	df=16
Private Service	3	5.0	8	13.3	11	18.3	p=0.892
Laborer	8	13.4	11	18.3	19	31.7	
Occupation Status of mother							
Housewife	25	41.7	24	40.0	49	81.7	
Self-Employed	3	5.00	3	5.0	6	10.0	χ^2=2.700
Government Service	-	-	-	-	-	-	df=4
Private Service	-	-	-	-	-	-	p=0.609
Laborer	2	3.3	3	5.00	5	8.3	
Family Monthly Income (in Rupees)							
≤ 10,000	12	20.0	14	23.4	26	43.4	χ^2=6.161
10,001-20,000	9	15.0	7	11.6	16	26.6	df=9
20,001-30,000	8	13.3	8	13.3	16	26.6	p=0.724
30,001-40,000	1	1.7	1	1.7	2	3.4	
> 40,000	-	-	-	-	-	-	
Religion							
Sikh	14	23.4	11	18.3	25	41.7	χ^2=0.433
Hindu	16	26.6	19	31.7	35	58.3	df=1
Muslim	-	-	-	-	-	-	p=0.510
Christian	-	-	-	-	-	-	
Residence							
Urban	29	48.4	30	50.0	59	98.4	-
Rural	1	1.6	-	-	1	1.6	
Dietary Pattern							
Vegetarian	22	36.7	21	35.0	43	71.7	χ^2=6.699

Variables under study	Experiment Group 1		Experiment Group 2		Total		χ^2
	n	%	N	%	n	%	
Non-Vegetarian	3	5.0	5	8.3	8	13.3	df=4
Eggetarian	5	8.3	4	6.7	9	15.0	p=0.153
Type of Family							
Nuclear	21	35.0	18	30.0	39	65.0	χ^2=2.745
Joint	6	10.0	5	8.3	11	18.3	df=4
Extended	3	5.0	7	11.7	10	16.7	p=0.601
Number of Family Members							
Two	-	-	-	-	-	-	-
Three	-	-	1	1.6	1	1.6	
More than three	30	50.0	29	48.4	59	98.4	
Number of Siblings							
None	-	-	1	1.6	1	1.6	χ^2=7.898
One	8	13.3	7	11.7	15	25.0	df=6
Two	18	30.0	16	26.7	34	56.7	p=0.246
More than Two	4	6.7	6	10.0	10	16.7	
Age of Menarche (in years)							χ^2=2.039
10-12	14	23.3	13	21.7	27	45.0	df=1
13-15	16	26.7	17	28.3	33	55.0	p=0.153

Table 2: Frequency and Percentage distribution of prevalence of anemia among adolescent girls (WHO classification of anemia) N= 291

Level of Anemia	Hb (g/dl)	n	%
Normal	≥12	121	41.6
Mild Anemia	10-11.9	106	36.4
Moderate Anemia	7-9.9	56	19.2
Severe Anemia	<7	8	2.8
Total		291	100.0

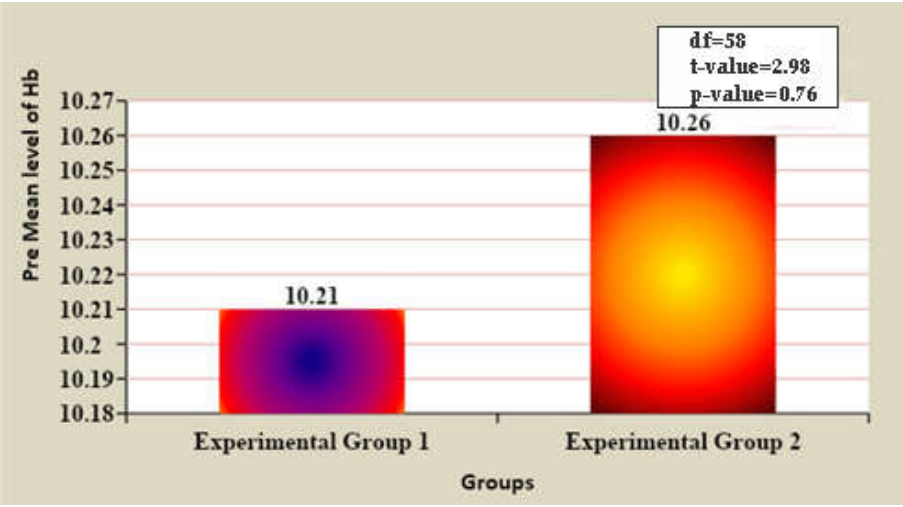

Fig. 1: Pre mean level of Hb among experiment group1 and experiment group 2

Table 3: Frequency and percentage distribution of level of Hb after administration of beetroot juice with lemon (experimental group 1) and beetroot juice without lemon (experiment group 2). N=60

Level of Hb (mg/dl)	Experiment Group 1 n=30			Experiment Group 2 n=30			Total		
	f	%		f	%		f	%	
9-10	1	1.6		5	8.4		6	10.0	
10.1-11	8	13.4	Mean=11.7 Sd=0.87	11	18.4	Mean=11.2 Sd=1.01	19	31.8	Mean=11.5 Sd=0.97
11.1-12	15	25		10	16.6		25	41.6	
>12	6	10		4	6.6		10	16.6	

Table 4: Comparison of post mean level of Hb among experimental group 1 (Beetroot juice with lemon) and experiment group 2 (Beetroot juice without lemon)

N=60

Group	Post Mean ± SD	df	t-value	p-value
Experimental Group 1 (n=30)	11.73 ± 0.878	58	2.18	0.03**
Experimental Group 2 (n=30)	11.26 ± 1.011			

**= significant at p< 0.05 level

Table 3 depicts that after interventions in both groups, only 6 (10.0%) anemic adolescent girls were in range 9-10 gm/dl (1 in experimental group 1 and 5 in experiment group 2). Slightly less than one third i.e. 19 (31.8%) were those with Hb range 10.1-11 gm/dl (8 in experimental group 1 and 11 in experimental group 2). 25 (41.6.%) with Hb level between 11.1-12 gm/dl (15 in experimental group and 10 in experimental group 2). Only 10 (16.6%) had Hb range >12 (6 in experimental group and 4 in experimental group 2).

Table 4 depicts the post mean level of Hb in both the groups. In experimental group 1, the post mean level of Hb is 11.73 ± 0.878 and in experiment group 2 it is 11.26 at df=58, t value=2.18 and p-value=0.03 which is significant. This means that there is difference in the post mean level of Hb.

Findings related to association of level of Hb with Sample Characteristics

It was found that age and class of study were found statistically significant with p value 0.034 and 0.019. That means Hb is more at less age as 22 adolescent girls had Hb between 10.1-11 gm/dl whereas only 14 were there in age group between 15-17 years. 14 girls in 8^{th}-9^{th} class and only 2 girls in 12^{th} class, had Hb between 10.1-11 gm/dl and. A statistically non-significant association was found between other variables like father's educational status, mother's educational status and occupation status of father, occupation status of mother, family monthly income, religion, residence, dietary pattern, type of family, number of family members number of siblings and age of menarche at p value > 0.05.

Discussion

The present study depicts that 58.4% adolescent girls were found to be anemic. 36.4% had mild anemia, 19.3% had moderate anaemia 2.8% had severe anemia and 41.6% had normal Hb. This finding is supported by a study conducted by *S Kaur, PR Deshmukh and BS Garg (2002)* [12] which concluded that prevalence of anemia was found to be 59.8%. 38.4% had mild anemia, 20.8% had moderate anemia, 0.6% had severe anemia and 40.2% had normal Hb.

The present study results show that beetroot juice is effective remedy so as to increase the haemoglobin fast in the body due to its high content of beta carotene and iron. It treats anemia by increasing blood count and improving blood circulation and oxygen carrying capacity of erythrocytes. This finding is supported by a study conducted by *Priya N Gayathri, Malavizhi M (2013)* [10] in which during beetroot juice was administered, there was highly significant improvement in Hb level after administration of beetroot juice.

Present study revealed that beetroot juice with lemon was more effective than beetroot juice without lemon. There was statistically significant association between the post levels among both the groups. This can be by prevention of the formation of insoluble and unabsorbed iron compounds and reduction of ferric to ferrous iron. Similarly *Teucher, Olivares (2004)* [13] revealed that ascorbic acid is the most efficient enhancer of non-heme iron absorption. The iron absorption enhancing effect of ascorbic acid is more potent than that of other organic acids due to its inability to reduce ferric to ferrous iron.

Conclusion

The intervention beetroot juice with lemon or without lemon was helpful in raising Hb among anemic adolescent girls. Post intervention mean of beetroot juice with lemon was 11.73 ± 0.878; similarly mean of beetroot juice without lemon was 11.26 ± 1.011 with df 58 and p-value 0.03 which was significant. Thus, it is evident from the results that beetroot juice with lemon is more effective in improving anemia among adolescent girls than beetroot juice without lemon. This remedy is easy to prepare and cost effective too.

Conflict of interest – Nil

Source of funding - Self

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STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS
"Journal of Global Public Health (JGPH)" (See Rule 8)

1.	Place of Publication	:	Delhi
2.	Periodicity of Publication	:	Half Yearly
3.	Printer's Name	:	**Dinesh Kumar Kashyap**
	Nationality	:	Indian
	Address	:	3/259, Trilokpuri, Delhi-91.
4.	Publisher's Name	:	**Dinesh Kumar Kashyap**
	Nationality	:	Indian
	Address	:	3/259, Trilokpuri, Delhi-91.
5	Editor's Name	:	**Dinesh Kumar Kashyap**
	Nationality	:	Indian
	Address	:	3/259, Trilokpuri, Delhi-91.
6.	Name & Address of Individuals	:	**Red Flower Publication Pvt. Ltd.**
	who own the newspaper and particulars of	:	41/48, DSIDC, Pocket-II
	shareholders holding more than one per cent of the total capital		Mayur Vihar, Phase-1, Delhi-91

I **Dinesh Kumar Kashyap**, hereby declare that the particulars given above are true to the best of my knowledge and belief.

Sd/-
(Dinesh Kumar Kashyap)

Prevalence and Practices of Self-Medication in Urban Population: A Cross Sectional Study in South India

Hemant Kumar[1], Pankajala Amritha Krishna[2]

Author's Affiliation: [1]Professor & HOD, [2]Clinical Tutor, Dept. of Community Medicine, AJ Institute of Medical Sciences and Research Centre (AJIMS & RC). Mangalore, Karnataka 575004, India.

Corresponding Author: Hemant Kumar, Professor & HOD, Dept. of Community Medicine, AJ Institute of Medical Sciences and Research Centre (AJIMS & RC). Mangalore, Karnataka 575004, India.

E-mail: doctorhemantkumar@gmail.com

Received on 08.06.2019; **Accepted on** 28.06.2019

How to cite this article:

Hemant Kumar, Pankajala Amritha Krishna. Prevalence and Practices of Self-Medication in Urban Population: A Cross Sectional Study in South India. Journal of Global Public Health. 2019;1(1):15-22.

Abstract

Background: Self -medication is a major global public health problem including India. High consultation fee and burden of avoidable investigation are the main causes of self-medication. Self-medication has advantages of being economical, convenient, time saving and reduces the burden on health care system for minor illnesses. However, there are certain side-effects of self- medication i.e. inappropriate usage of antibiotics leading to drug resistance, wastage of resources and adverse drug reactions.

Methods: Present study was a cross sectional study among the selected population in urban in urban field practice area of AJIMS & RC, Mangaluru. Face to face interviews were conducted using the validated questionnaire.

Results: A total of 472 heads of families were included in the study. High prevalence (62.7%) of self-medication was observed among the study subjects. Self-medication was mainly used for common minor problems (72.4%), while antipyretics were the commonest (71.4%) drug used. Self-medication was found to be more among professionals, those who had higher educational qualification and belonged to higher socio-economic strata. Pharmacies were the most common source of procurement of drugs.

Conclusion: The study brought out high prevalence of self-medication.

Keywords: Self-medication; Pharmacy; Professionals; Socio-economic strata.

Introduction

Self-medication (SM) is use of any drug, substance or any exogenous influence without prior medical consultation regarding its indication, dosage or duration for the treatment of one's own physical or psychological ailments [1]. The World Health Organization (WHO) defines SM as "use of pharmaceutical or medicinal products by a consumer to treat self-recognized disorders or symptoms, the intermittent or continued use of medication previously prescribed by a physician for chronic or recurring disease or symptom, or use of medication recommended by lay sources or health workers not entitled to prescribe medicine" [2]. Further, SM has been considered a quick and convenient method of comfort to anindividual. Besides, it also reduces the load on the medical services, decreases the waiting time and saves expenditure onconsultation to the individuals. However, SM is not free from the risks of side effects and other complications which include seeking of delayed medical advice, increased drug resistance, drug interactions and adverse health outcomes [3].

Self-medication patterns are influenced by educational status, family background, socio-economic status, profession etc. Further, the easy availability but uncertain scientific validity of information on the electronic media has had both beneficial and detrimental effects [4]. Practiced globally, SM is global health problem, with a prevalence of 0.1% in northern and Western Europe to 27% in USA. However, the developing world shows much higher prevalence i.e. 67% in Nigeria and 79% in India [5]. Analgesics and Antibiotics are the most commonly SM drugs worldwide, nearly 50% procured without a prescription which resulting in widely prevalent antibiotic resistance [6]. In India, important causes of SM are poor accessibility to healthcare services; especially in rural areas, illiteracy, poverty, and influence of advertisements in print and electronic media.

In India, Schedule H (prescription drugs) and Schedule H1 (antibiotics and other restricted medications) can be sold by a legally qualified registered pharmacist upon presentation of valid prescription as per Drug and Cosmetics Act of 1940 [6]. A majority of the population when they fall ill not consult with the healthcare professionals especially in rural or small cities In India. However, they do consult directly to the pharmacy and/or retail drug store and can easily get medications for oneself.

Though in India, from 01 March 2014, Central Drugs Standard Control Organization (CDSCO) has imposed to control the rampant sale of over-the-counter (OTC) drugs in India and makes it mandatory for the pharmacists to maintain a separate register and record the details of the patient, prescribing doctor and the sold quantity and names of the drugs [8].

Review of literature reveals limited studies on SM practices in Karnataka, especially in Mangaluru. In the backdrop of above, a study was undertaken in urban part of Mangaluru with the following objectives.

Research Objectives

1. To determine the prevalence, practices and determinants of self-medication among the residents of the urban field practice area of AJIMS & RC, Mangaluru.
2. To determine association between self-medication practices with selected demographic variables i.e. education, occupation and socio-economic status.

Material and Methods

Present study was undertaken in the urban field practice area of A. J. Institute of Medical Sciences & Research Centre, Mangaluru. All heads of families (including males as well as females) who were empowered to make decisions in the family matters comprised the study population. In case of their absence, another family member who was also involved in decision-making as interviewed to obtain the desired information.

Families who used only Allopathic system of medicine for Self-medication were included in the study while families who practiced self-medication with alternate systems of medicine and families having any member qualified in the allopathic system, pharmacy, nursing, or any other paramedic stream were excluded from the study.

For the purpose of this study, Self -medication (SM) was defined as use of any Allopathic drug (s) to treat self-diagnosed disorders or symptoms or the intermittent or continued use of prescribed drug(s) for chronic or recurrent disease or symptoms during past six months without consultation with a qualified allopathic doctor (possessing minimum MBBS degree) at least on one occasion.

As the"urban field practice area" of AJIMS & RC, Mangaluru is divided into nine sub-sectors, multi-stage sampling was adopted to select the houses and to select the number of houses in each area, Probability Proportional to Size (PPS) method was followed.

Within each area, houses were selected using Simple Random Sampling till a total sample size of 472 was achieved out of the 1035 families residing in the urban field practice area. The study was conducted over period of one year, i.e., from 01 Jun 2017 to 31 May 2018.

Ethical clearance as obtained before the conduct of the study. All selected households were visited and the heads of the families were interviewed after explaining the purpose of the study in their local language and taking an informed written consent. A semi-structured questionnaire was used to record the socio-demographic characteristics of the family and the pattern and practices of self-medication.

Operational Definitions

1. *Self-medication*: Use of any drug, substance or any exogenous influence without prior medical consultation regarding

its indication, dosage or duration for the treatment of one's own physical or psychological ailments.

2. *Head of the family*: is the member of the family who has the authority to make important decisions for the family.
3. *Routine illness*: An illness which does not affect a person's day-to-day activities.
4. *Moderate illness*: An illness which affects a person's day-to-day activities and compels him/her to stay away from work.
5. *Severe illness*: An illness that warrants an immediate consultation with a doctor, hospitalisation or absence from work and continued supervision of a doctor.
6. *Over-the-counter (OTC) drugs*: Are medicines sold directly to a consumer without a prescription from a healthcare professional, as opposed to prescription drugs, which may be sold only to consumers possessing a valid prescription.

Statistical Analysis

The data obtained was analyzed for both descriptive, as well as inferential statistics on basis of the objectives of the study, using Microsoft Excel 2010 and IBM SPSS Statistics 21.0 trial version. For descriptive Statistics, Frequencies, Percentages, Means, Standard deviation have been used. For inferential statistics used to determine the association between various characteristics, Pearson Chi square test has been employed.

Results

Table 1 brings out that most (72.8%) of the study subjects were males and majority of them (50.63%) belonged to the age group of 31 to 50 years, while their mean age was found to be 53 years (SD ± 13 years). There were no heads of families under the age of 20 years. Majority (69.9%) of respondents were married, (24.1%) had finished primary education and nearly one-fourth (24.3%) of them were skilled workers. Further, most (70%) of the families were of nuclear type, average family size was four (SD ± 1), most (76.6%) of them were Hindu by religion and nearlyhalf (43.4%) of the families belonged to Social class III, i.e., Lower middle class according to the revised *Kuppuswamy* socio-economic classification.

Table 1: Socio-demographic characteristics of study subjects. (n=472)

Variable	Frequency	Percentage
Age group (in completed years)		
21 to 30 years	05	1.05
31 to 40 years	104	22.03
41 to 50 years	135	28.6
51 to 60 years	101	21.39
61 to 70 years	59	12.5
Above 70 years	68	14.4
Gender		
Male	344	72.88
Female	128	27.11
Marital status		
Married	330	69.91
Separated/Divorced	04	0.84
Widowed	138	29.23
Religion		
Hindu	362	76.69
Christian	29	6.14
Muslim	69	14.61
Others	12	2.54
Educational status		
Illiterate	42	8.89
Primary school	114	24.15
Middle school	71	15.04
High school	105	22.24
PUC or diploma	52	11.01
Graduate/postgraduate	65	13.77
Professional/ Honors	23	4.87
Occupation		
Unemployed	105	22.24
Unskilled	89	18.85
Semiskilled worker	56	11.86
Skilled worker / Homemaker	115	24.36
Clerical / shop-owner / farmer / businessman	73	15.46
Semi-professional	27	5.72
Professional	07	1.48

**based on Revised Kuppuswamy classification of Socio-economic status*

Figure 1, brings out prevalence that 63.77% of the study subjects practiced self-medication on at least one occasion during last six months, while remaining 36.23% did not practice any self-medication and took medication only after the advice of a qualified MBBS doctor.

Table 2, brings out that 65.67% of the respondents were awareness and had knowledgethat medicines should be consumed only after consultation with a doctor and 45.33% of them felt that it is not safeto continue medication even in chronic illnesses. Further, 87.71% were awarethat medicines must be discarded after expirydate, while nearly every respondent (94.27%) refrained from self-medication practices when it came to treating their own children.

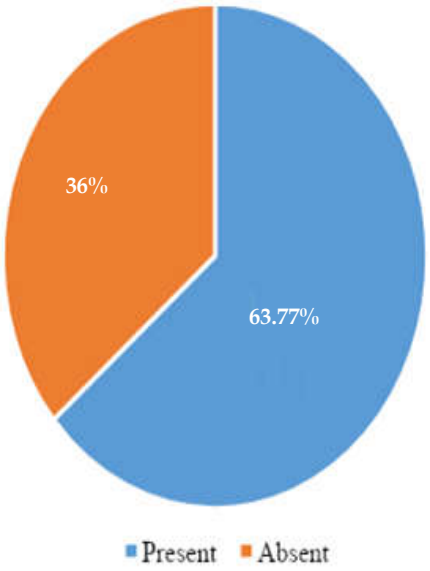

Fig. 1: Self-medication practices among study subjects (n=472)

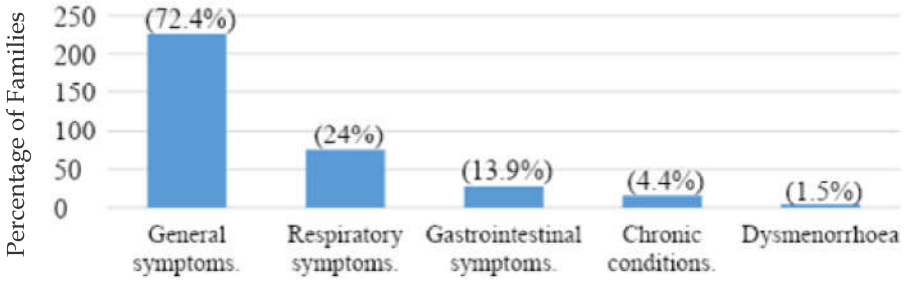

Fig. 2: Common symptoms for which SM was practiced by study subjects (n=472)

Table 2: Attitude and practices on self-medication (n=472)

Knowledge	Frequency	Percentage
Medicines should be consumed only after consulting a doctor.		
Present	310	65.67
Absent	162	34.32
Is it safe to continue medicines for chronic conditions without a follow up?		
Yes	258	54.66
No	214	45.33
Concept of "expiry date"		
Present	414	87.71
Absent	58	12.28
Self-medication must not be practiced for children.		
Agree	445	94.27
Disagree	27	5.72
Total	472	100

**For the purpose of this study, "children" were considered to be of less than 14 years of age.*

Figure 2 brings out common symptoms for which SM was practiced among study subjects. The study reveals that majority of the respondents (72.4%) used SM for general symptoms like headache, body ache, mild sprains etc., followed by respiratory symptoms (24.0%), diarrheal diseases and gastric -acidity related disorders, while 4.4% of them practiced SM for chronic conditions like osteoarthritis, low back ache etc. A small percentage of women (1.5%) also used anti-spasmodic drugs for dysmenorrhea.

Figure 3 brings out commonly used drugs for self-medication. The study reveals that antipyretics ere the most commonly used drugs (71.4%), followed by analgesic group of drugs(49.5%), cough syrups (19.2%), anti-histaminics (14.2%), anti-hypertensives (10.9%) ant-acids (10.6%) and oral hypoglycemic agents (7.6%). A very small percentage of respondents used antispasmodic agents and antiemetic drugs also, i.e.1.3% and 0.6% respectively.

Figure 4 brings out common sources of drug procurement for self-medication. The study reveals that the commonest source of procurement of drugs for self-medication has been the pharmacies (92.3%) where the drugs are readily available over the counter (OTC), without any prescription from the doctor in our country, followed by clinics (73.2%), friends/relatives (5.7%), neighbors (3.3%) and other miscellaneous sources.

Figure 5, brings out that Allopathic system of medicine was the most preferred system as out of the 472 families 63.77% of them practiced it. However, out of 472 families there were 126 (26.6%) families who utilized alternate system of medicine for SM, during last six months. The analysis further revealed that most of these 126 families i.e. 66.6% of them practiced Ayurveda, followed by Homoeopathy (28.5%), and Yoga & Naturopathy (13.4%). However, none of the families were found using Siddha or Unani.

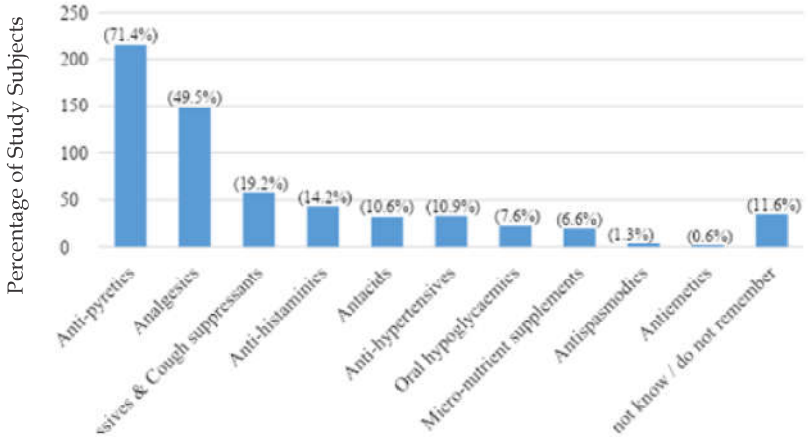

Fig. 3: Commonly used drugs for self-medication among (n=472)

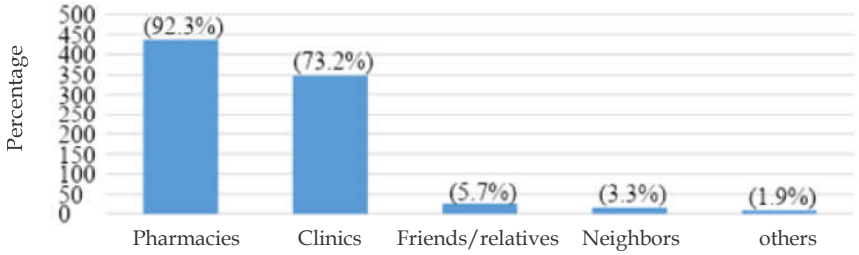

Fig. 4: Common sources of drug procurement for self-medication (n=472)

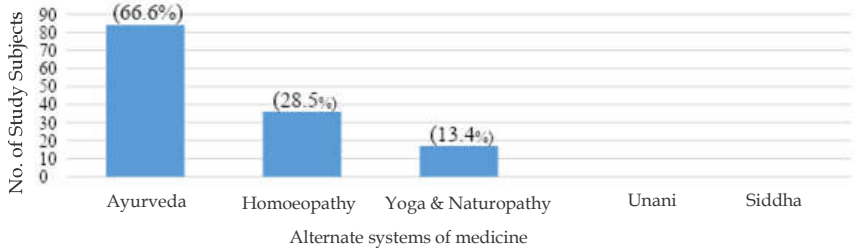

Fig. 5: Pattern of alternate systems of medicine practised by study subjects. (n=126)

Table 4: Association of socio-demographic characteristics with prevalence of self-medication (n=472).

Variables	Prevalence of Self-medication					χ^2	p value
	Present	%	Absent	%	Total		
Educational status of Head of family							
Professional / Honors	20	87	3	13	23	12.76	0.04
Graduate / Postgraduate	47	72.3	18	27.7	65		
PUC / Diploma	35	67.3	17	32.7	52		
High school	67	63.8	38	36.2	105		
Middle school	38	53.5	33	46.5	71		
Primary school & below	94	60.25	62	39.75	156		
Occupation of Head of family							
Professional	07	100	0	0	07	33.87	0.000
Semi-professional	13	48.1	14	51.9	27		
Clerical / Shop owner / Farmer / Businessman	46	63	27	36.9	73		
Skilled / Homemaker	62	53.9	53	46.1	114		
Semi-skilled	32	57.1	24	42.9	56		
Unskilled & Unemployed	142	72.8	53	27.1	195		
*Socio-economic status**							
Class I	3	100	0	0	3	9.72	0.02
Class II	119	71.7	47	28.3	166		
Class III	118	57.6	87	42.4	205		
Class IV	61	62.2	37	37.8	98		

Table 4, brings out association between prevalence and practice of SM with selected demographic variable i.e. educational level, occupation and socio-economic status. The occupation of the head of the family was found to be significantly associated with SM i.e. profesionals had higher prevalence and practice of SM as compared to semi-skilled/ unskilled workers (p=0.00). Higher prevalence of SM was also found among those respondents who possessed higher educational qualification or belonged to higher socio-economic strata and these associations were also found to be statistically significant with p values being ($p<0.04$) and ($p < 0.02$) respectively.

Discussion

Self-medication (SM) is a human behavior. High consultation fee and fear of being subjected to unnecessary investigations, convenience ofself-medication and time constraints are primarily responsible for high prevalence of SM in the Indian population. In a survey conducted by a web portal that interviewed 20,000 people in 10 cities in India, brought out nearly 52% of the people indulged in self-medication [9]. Families, friends, neighbors, pharmacist, old prescriptions, suggestions from an advertisement in newspapers or popular magazines are common sources of information for drugs for SM.

In present study (72.8%) of the study subjects were males, nearly half of them of them (50.63%) belonged to 31 to 50 years the age group, their mean age was 53 years (SD ± 13 years), majority (69.9%) of them were married, 24.1% had finished primary education and nearly one-fourth (24.3%) of them were skilled workers and nearly half (43.4%) of the families belonged to Social class III. Similar results were reported by Akram Ahmad, et al., in their study in North India who reported mean age of their participants to be 28.28 ± 4.02, while majority of the participants were male (58.4%) [10].

Present study brings out overall prevalence of 63.77% of SM among study subjects. Similar prevalence (51.7%) of SM was reportedby Vinithra Varadarajan, *et al*., in their study in urban population in Chennaiwhile Akram Ahmad, et al., observed in their study 100% prevalence of SM. In another study by T Aqeel, *et al.,* in Islamabad, a prevalence of self-medication was observed to be 61.2%; while in a study among college students by Dipan Uppal, *et al*., in Delhi University a prevalence of SM was reported to be 93%. However, it may not be prudent to compare the findings of various studies as study subjects in different studies belonged to different geographical regions and different socio-cultural patterns [11-13].

In present study 65.67% of the respondents agreed that medicine should be consumed only after consulting a doctor, 54.66% of them felt that it was safe to continue medicine for chronic illnesses even without a follow up and 87. 71% of the study subjects had concept of expiry date. However,

nearly all the respondents (94.27%) felt that for children it was not safe to indulge in SM and they should be given medication only after consulting a qualified doctor. Dipan Uppal, *et al.,* in their study reportedthat almost all (96.5%) the respondents were conscious about the expiry date of drugs and used them only after checking it. Further, 47.5% of them chose SM for any illness initially while 40% of medical students disagreed as they were aware of adverse effects of thedrugs [13].

Present study reveals that majority of the respondents (72.4%) used SM for general symptoms while (24.0%) of the respondents used SM for respiratory and Gastro-intestinal disorders while 4.4% of them used SM for chronic conditions like osteoarthritis and low back ache etc. Similar findings have been reported by Vinithra Varadarajan who in their study observed that SM was used mainly for common cold (73.02%), aches and pains (51.97), and fever (32.2%). In a similar study by Akram Ahmad, et al., it was observed that use of non-prescription drugs for fever was higher in urban population (23%) as compared to rural subjects (9%), while SM was highest for skin diseases among rural respondents (10%) [10-11].

Present study brings out antipyreticsas the most commonly used drugs (71.4%), followed by analgesics (49.5%) and cough syrups (19.2%). A very small percentage of study subjects used antispasmodic agents and antiemetic drugs as well i.e. 1.3% and 0.6% respectively. Dipan Uppal, *et al.*, in a similar study reported that most commonly used medicines were cold remedies among non-medical and analgesics among medical students. Cold remedies, analgesics, antipyretics and antibiotics have been reported as the most commonly used drugs for SM by many other studies as published in many studies. Present study further brings out pharmacies as the most common source (92.3%) of drug procurement for SM, followed by clinics (73.2%), friends/relatives (5.7%) and neighbors (3.3%). However, Dipan Uppal, *et al.,* in their studyreported most common source of self-medication was the available first aid kit in 46.5% of subjects, followed by chemists (38%). Chemists as a source were significantly more in non-medical students (p=0.002) [13].

Present study brings out that Ayurveda system of medicine was the most preferred alternative system of medicine as out of 126 families who utilized alternate system of medicine, 66.6% of them practiced Ayurveda, followed by Homoeopathy (28.5%), Yoga & Naturopathy (13.4%). Similar findings have been brought out by Shyam Sunder Keshari, *et al.*, in their study in Uttar Pradesh (India) who found that majority of the respondents were taking Allopathic drugs (69.6%) followed by Ayurveda drugs (13.1%) and Homeopathic drugs (10.7%) [14].

In present study the occupation, educational qualification and socio-economic strata of the head of the family were found to be significantly associated with SM i.e. profesionals, respondents who possessed higher educational qualification or belonged to higher socio-economic strata had higher prevalence of SM. In a similar study by Dnyanesh Limaye, et al., prevalence of self-medication was found to be highest among participants who were post graduate educate ($p \leq 0.000$), having chronic disease (109/259; 42%; $\chi 2 = 25.3$; $p \leq 0.000$; OR = 2.01; CI 95% = 1.5-2.6) and those having monthly income of e50,000 Indian rupees ($p \leq 0.000$) [15].

Limitations

Present study had the limitation which are inherent to cross sectional studies as they do not provide conclusive temporal association. In present study six months recall period was used, which may havehad a recall bias. Further, many respondents may not have liked to disclose the drugs used by them for personal reasons. As this study was conducted in southern part of India which has its own socio-cultural pattern and morbidity profile and pattern of using home remedies, findings of this study may not be generalised to other parts of India.

Conclusion

Studies across the country suggest a rising trend in self –medication and indicate nearly half of the population in the country practices self-medication. Present study also brings out a high prevalence of SM among the study subjects. Further a higher trend of SM was observed among those who belonged to higher socio-economic strata, had higher educational status and were professionals by occupation. Further, the drugs, (including schedule-H and H1 drugs) have been easily available over the counter without any check, resistance or demand for a prescriptions. Studies further indicate that high costs of consultation and investigations are the most important factors responsible for self–medication. Needless to say that there is an urgent requirement to make basic health care facilities available in all areas and strengthen and enforce existing regulations regarding OTC drugs most stringently to stop in discriminate use of drugs, which is perhaps one of the main causes of

emerging drug resistance to common anti-biotics in our country.

Recommendations

The study brings out that self-medication is common practice amongst urban communities. However, there are no health education programmes to create awareness among the masses about possible adverse effects of self-medication and the pre-cautions needed for in Self-medication.

Our pharmacies are also required to be educated about the regulations on schedule-H and H-1 drugs which are not permitted for sale over the counter and maintenance of records of all medicines sold with and without prescriptions. The pharmacists may be further advised to educate, as well as counsel the patients on the usages of medications, their doses and possible adverse reactions while dispensing the drugs.

Acknowledgement

Authors acknowledge with gratitude the cooperation of all the study participants and help of field staff in the conduct of this study.

Funding: No funding sources.

Conflict of Interest: None.

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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Rehabilitation for Chronic Diseases

Karthika S.

Author's Affiliation: Karthika S., Associate Professor, Rayat Bahra College of Nursing, Rayat Bahra University, Mohali, Punjab 140104, India.

Corresponding Author: Karthika S., Associate Professor, Rayat Bahra College of Nursing, Rayat Bahra University, Mohali, Punjab 140104, India.

E-mail: jerushakarthika87@gmail.com

Received on 04.06.2019; **Accepted on** 28.06.2019

How to cite this article:

Karthika S. Rehabilitation for Chronic Diseases. Journal of Global Public Health. 2019;1(1):23-26.

Abstract

With the emerging communicable and non-communicable diseases in this advanced world, rehabilitation is an essence in healthcare in preserving the remnant activities of the people living with such diseases. The major components revolves in creating the attitude towards people, provision of education and training opportunities, provision of rehabilitative services, provision of long-term facilities, prevention of causes of disabilities, monitoring & evaluation, creation of micro & macro income generation and empowerment through approaches such as social mobilization-opportunities-through empowerment, advocacy, negotiation, political participation, language, communication, self help groups-increased awareness of civil rights, responsibilities, increased knowledge of benefit from policies and programs, ability to get grievances.

Keywords: Chronic; Diseases; Rehabilitation.

Introduction

Community based rehabilitation is the strategy within community development for rehabilitation, equalisation of opportunities and social inclusion of all people with disabilities. It was evoluted with the concepts of disability & rehabilitation, human rights, poverty and inclusion of communities. The key principles are equity, social justice, solidarity, integration and dignity. Thus the objectives of CBR in any area is framed to identify all persons with disability, provide rehabilitative service, create awareness, transfer rehabilitative skills to community members, mobilize available resources & rise funds, raise the community participation and prioritize the services. Hence the community health nurse plays a key role in providing different rehabilitative services in the community.

Definition

The coordinated sum of interventions required to ensure the best physical, psychological and social conditions so that patients with chronic or post-acute disease may, by their own efforts, presence or resume optimal functioning in society and through improved health behaviour, slow or reverse progression of disease.

-Globe & Worcester.

Objectives

1. To enhance care and quality of life for people experiencing chronic disease.
2. Support self management and increase functional independent for people with chronic disease.
3. Help avoid unnecessary hospitalisation, presentations and admissions.
4. Reduction in premature mortality.
5. To achieve optimal physical, psychological

function.

6. To self manage their disease.
7. To be active partners with their medical team in decisions about their health care.

Chronic Diseases Include

- ✓ CVD
- ✓ Cancer
- ✓ Chronic respiratory disease
- ✓ DM
- ✓ Chronic renal disease
- ✓ Arthritis and musculoskeletal disease
- ✓ Mental health problems and disorders

Features of Chronic Diseases

- ➢ Complex and multiple cause
- ➢ Gradual and sudden onset with acute stage
- ➢ Occurring across the life cycle
- ➢ Compromising QOL through physical limitations and disability
- ➢ Long-term and persistent
- ➢ Gradual deterioration of health

Aims

- Enhance QOL by supporting self-management & independence
- Provide education & support to achieve self-management
- Improve functional exercise capacity
- Delay and avoid complications
- Reduce avoidable hospital presentations & admissions

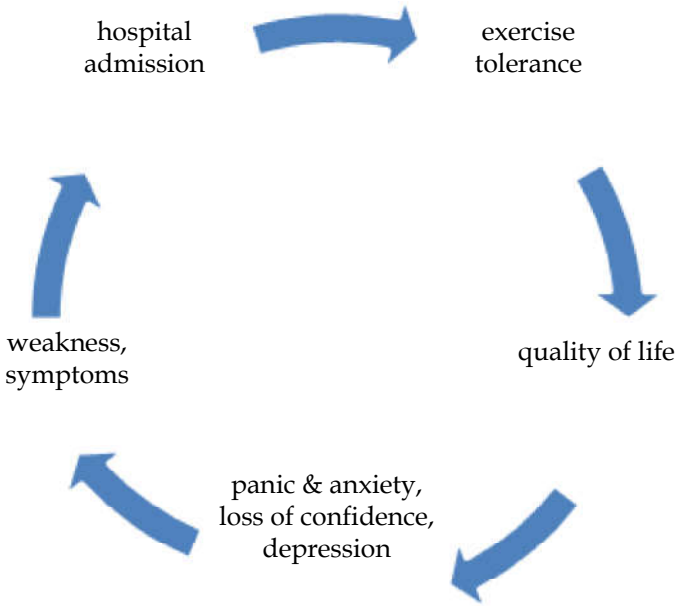
Principles

1. Early & accurate diagnosis
2. Supported management

Elements

1. Easy & early access
2. Comprehensive assessment
3. Holistic goal setting
4. Evidence based, multi-disciplinary interventions
5. Maintenance & support

Chronic Disease Disability Spiral (Model)



Process of RCD

1. Early and easy access to diagnosis & rehabilitation services
2. Comprehensive assessment
3. Evidence- based, multi-disciplinary interventions
4. Holistic goal setting
5. Links to ongoing maintenance & support programs

Staffing for RCD

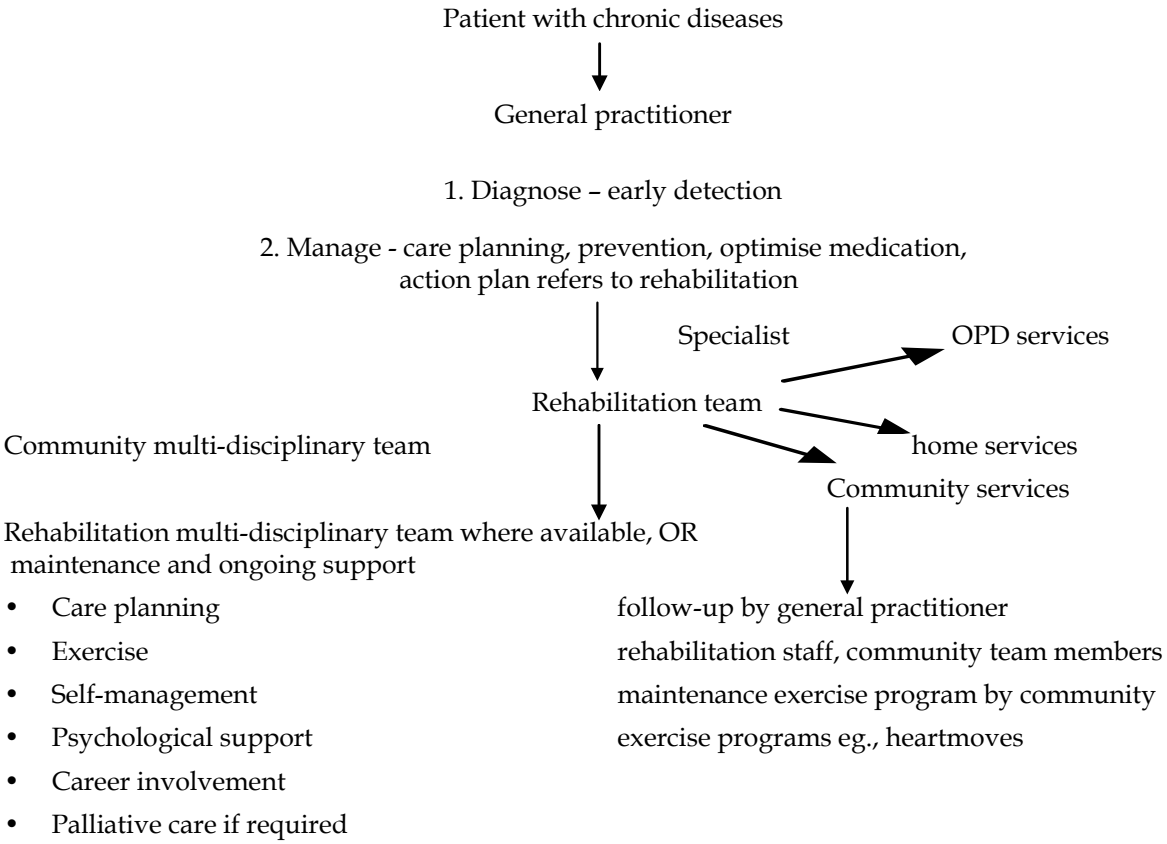
Multi-disciplinary team

1. Medical Officer
2. Nursing & allied health staff
3. Administrative Officer
4. Medical staff-General Practitioners
5. Coordinator
6. Clinical supportive staff

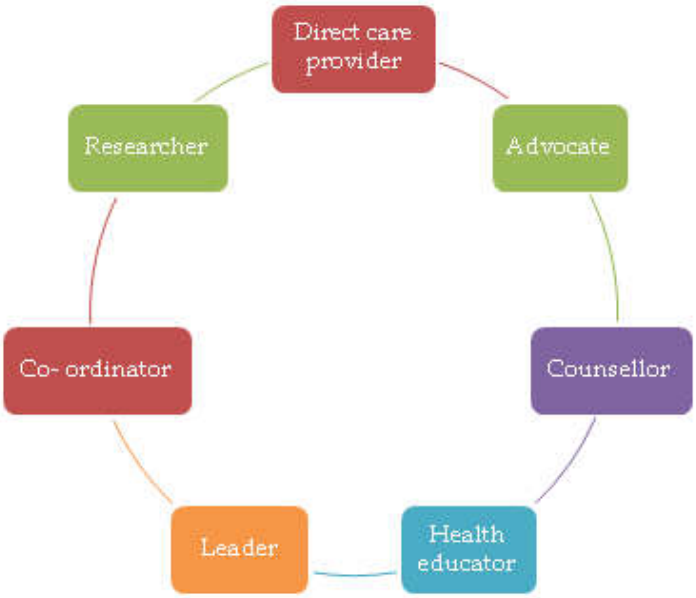
Implementing Rehabilitation for Chronic Diseases

Strategies	Planning
Governance	➢ Determine the type of rehabilitative service model ➢ Identify leaders ➢ Develop a process map ➢ Develop a project timeline ➢ Establish a steering commitee
Patient journey	➢ Map the patient journey ➢ See the correct rehabilitation for chronic disease
Policies & protocols	➢ Identify policies protocols & guidelines ➢ Check these key issues ➢ Review the rehabilitation literature ➢ Review the rehabilitation assessment tools ➢ Review or develop agreements with general practiotioners and other community partners.
People	➢ Stakeholder analysis ➢ Engage SH ➢ See the ideal staffing ➢ Develop a staff people ➢ Learn and understand the roles of all team members ➢ Identify existing teams to build capacity
Resources	➢ Conduct a resource survey ➢ Establish referral processes ➢ Identify the gaps
Communi-cation	Develop a communication plan

Flowchart of Process



Role of Public Health Nurse in Rehabilitation for Chronic Diseases



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Plastic Pollution and Their Impact on Health and Environment

Choodamani Chandrakar[1], Sanjay Shakya[2], Anil Patyal[3]

Author's Affiliation: [1]Scholar, [2]Professor and Head, [3]Assistant Professor, Department of Veterinary Public Health & Epidemiology, College of Veterinary Science and Animal Husbandry, Kamdhenu Vishva Vidyalya, Durg, Chhattisgarh 491001, India.

Corresponding Author: Anil Patyal, Assistant Professor, Department of Veterinary Public Health & Epidemiology, College of Veterinary Science and Animal Husbandry, Kamdhenu Vishva Vidyalya, Durg, Chhattisgarh 491 001, India.

E-mail: anilvet01@gmail.com

Received on 07.05.2019; **Accepted on** 08.06.2019

How to cite this article:

Choodamani Chandrakar, Sanjay Shakya, Anil Patyal. Plastic Pollution and Their Impact on Health and Environment. Journal of Global Public Health. 2019;1(1):27-33.

Abstract

Plastic is a kind of material that is commonly known and used in everyday life in many forms. It becomes a very important part of each one's life. Increasing population and also the growth of producing sectors in developing countries have inflated the demand for plastic production. In proportion to the expansion of plastic trade, generation of plastic waste is additionally increasing. However, recovery and recycling of this waste was not sufficient resulting in the buildup of those plastics in landfills and oceans per annum. Plastic become a major environmental pollutant of present time. Being composed of toxic chemicals and most significantly a non-biodegradable substance, plastic pollutes earth and ends up in soil and water pollution. Various toxic substances releasing from plastic degradation and these pollutant was consumed by plankton and other minor invertebrates, thus becoming part of food chain, reaching humans in the end. According to the varied studies of wide unfold presence of plastics, in several compartment of ecosystem its potential that organisms in terrestrial and fresh can en-counter plastic particles. These contaminants usually have well known generative, cancer, and agent effects. The government, law implementing agencies and health authorities of the country ought to take a lot of steps for sustainable production and proper disposal of plastic wastes.

Keywords: Plastic; Organopolymeric; Non-biodegradable; Toxic.

Introduction

Plastic is universally known as the materials for the 21st century, is a synthetic or semi-synthetic compound that can be molded into the solid substance of any shape. Alexander Parkes, a metallurgist and he synthesize Parkesine 'the first man-made plastic' in the 1860s, and commercial application of plastic was discovered in 1920s [1]. From the point of its invention to till date plastic industry has turned out to be a one of the fastest developing worldwide ventures. At present, worldwide plastic creation is around 335 million metric tons, and the worldwide plastic industry produces income of about $600 billion every year [2]. Expanding population and the development of packing and manufacturing divisions in developing nations have expanded the interest for plastic generation. Now a days plastic production is likewise moved to Asian nations. Asian developing countries like China and India are contributing about 34.8% of the world's plastic production [3] but in case of Europe the plastic production is static from 2002 to 2026 and it might close around 60 million metric tons.

Because of various alluring attributes like less cost, simplicity of generation, flexibility and dampness opposition, and plastics have picked up a great deal of modern applications and it likewise dislodged numerous ordinary materials, for example, wood, stone, cowhide, and numerous others. The scope of value of plastic in assembling a colossal and extending scope of items, for example, from paper clasps to space ships [4]. All around, there is an exponential addition in the per capita use of plastics. In the 1980's per capita plastic use was around 11 kg and, in 2015, it is around 28 kg for every individual [2]. In India average per capita plastic utilization was around 11 kg for each individual in 2015 and thinks about have evaluated that in the following 5 years, modernization and rising commercialization will reach to 22 kg per capita usage of plastics [5]. Consumption pattern of plastics is more or less similar in both India and world because packing and infrastructure sector are the main sector which uses plastic and agriculture sector uses least amount of plastics in world as well as India.

Reason behind rapid increase in plastic waste

Plastic are the most easily accessible things in the present world. Plastics are shabby and simple to make and are similarly sturdy. They likewise get disposed of very easy. These properties are the ones making plastics an immense contaminating agent. Plastics are utilized as packaging materials, in home utilities, plastic containers, straws, plastic paper packs, jars, and the rundown goes on. Expanding population and urbanization rate in past years is extensively responsible for plastic contamination. With the expansion of population and urbanization, the interest for less expensive and promptly accessible materials increases. As stated thatbefore, plastic are very easily disposed thing, because of their lightweight and use period. Like examples of plastic paper sacks, wrappers, plastic water bottles, straws, and nourishment holders [6]. The utilization time of these things is exceptionally short. In this way, subsequent to getting the plastic, a great many people don't see the need of keeping the remaining plastic. Plastics take many years to degrade because they have strong chemical bonds. The commonest plastics such as the ones used in carry bags in stores take at least 50 years to break down while the other complex type of plastics can take between 100 and 600 years to decompose. EPA likewise expressed that "all of plastic at any point made still exists." On this respect, it implies that as long as new plastics will keep on being made, they will continue to exist all through the planet adding to plastic contamination [7].

Plastic Waste Generation in India

According to the investigation led by Central Pollution Control Board (CPCB) in 60 cities of India, it has been seen that around 4059 T/day of plastic waste is generated from these urban communities. The portion of plastic waste altogether Municipal Solid Waste (MSW) shifts from 3.10% (Chandigarh) to 12.47% (Surat). Normally plastic waste is around 6.92% of MSW. With extrapolation of the plastic waste generation information from 60 cities, it is assessed that around 25,940 T/day of plastic waste is generated in India. According to the investigation, out of absolute plastic waste, around 94% waste involves thermoplastic substance, which is recyclable, for example, PET, LDPE, HDPE, PVC and so on and remaining 6% has a place with the group of thermoset and different classifications of plastics, for example, sheet shaping compound (SMC), fiber fortified plastic (FRP), multi-layered, thermocol and so on which is non-recyclable [8].

Life Cycle Assessment of plastics

Life Cycle Assessment (LCA) is a procedure to survey the potential natural and environmental burden related with an item, a procedure or an action. Attributes parts in a LCA are distinguishing and measuring of vitality streams and material streams and assessing the natural effects that are related with these streams. The evaluations ordinarily incorporate the whole life cycle of the contemplated framework (the examined framework can be an item, a procedure or an action) including material and vitality crude product obtaining, make use and transfer/squander the board [9]. In LCA the ecological issue is more connected with the item from "the support to the grave", along these lines including every natural weight that are related with the studied product during its whole life cycle or life time.

Impact and risk caused by plastic pollution

Impact on environment

Plastic is one of the major lethal poisons of present day time. Being made out of ototoxic synthetic substances and most essentially a non-biodegradable substance, plastic contaminates earth and leads contamination of various natural compartments like soil, and water contamination.

This additionally blends with evolved way of life and influencing people and creatures heaths. There is no protected method to arrange plastic waste and these squanders makes genuine harm condition amid its generation procedure, amid its utilization and transfer process. Rather that poisonous synthetic concoctions discharge amid assembling process is another noteworthy wellspring of the negative natural effect of plastics.

Impact and risk caused by plastic pollution

Impact on environment

Plastic is one of the major toxic pollutants like a lethal poison of present day time. Being made out of ototoxic synthetic substances and most essentially a non-biodegradable substance, plastic contaminates earth and leads contamination of various natural compartments like soil, and water ecosystem. This additionally blends with food chain and influencing people and creature's heaths. There is no protected method to dispose plastic waste and these wastes causes serious damage to environment during its production process, during its usage and disposal process. condition amid its generation procedure, amid its utilization and transfer process. Rather that poisonous synthetic chemical discharges during fabrication process is another potential source of the negative ecological impact of plastics. It is a source of cancer-causing, neurotoxic, and hormonal disturbance causing troublesome synthetic substances and waste results of plastic creation, and they unavoidably find their way into our environment through water, land, and air contamination. A portion of the significant mixes incorporate vinyl chloride (in PVC), dioxins (in PVC), benzene (in polystyrene), phthalates and different plasticizers (in PVC and others), formaldehyde, and bisphenol-An, or BPA (in polycarbonate). A considerable lot of these mixes are persistent organic pollutants (POPs) probably the most harming poisons on earth, their unmitigated discharge into the earth influences all earthbound and sea-going existence with which they come into contact. It is in the utilization stage that the advantages of plastics in solidness and viability are generally clear. Despite the fact that most plastics are very harmful for human as well for the ecosystem [10].

Threats on aquatic/marine species

A lot of plastic waste in the marine ecosystem make physical hazard for marine life form by way of ingestion or on the grounds that they become caught in these waste [11]. Plastic is coincidentally swallowed by fish, turtles and different creatures and can affect reproductive organs or cause lethality due to toxic chemicals. Numerous marine species tangled in fishing nets, or tangles of gout, thrown irresponsible [12]. Polystyrene nanoparticles coming because of plastic degradation alter the properties of the cell membrane and the action of specific proteins. The plastic utilized most commonly, are a major part of the waste thrown into the sea.

Imbalances in food chains

Plastic is degraded by the activity of water, into small particles that being easily mistaken with representatives of plankton. Creatures like *Phoebastrianigripes* (an albatross species) or ocean turtles, die due to the plastic articles ingestion. These species can be prey to bigger creatures and could add to auxiliary ingestion via seabirds [13] that is the reason it lead to imbalance in natural food chain.

Plastic pollution in the soil environment

Different sources of plastic that contaminate ecosystem have been reported [14]. These incorporate household sewage, containing strands from apparel and microplastic beads from personal care products, biosolids [15], manures [16] landfills from urban and industrial centers [17] water system with wastewater, lake water flooding, littering streets and unlawful waste dumping vinyl mulch utilized in horticultural exercises tire scraped area and environmental particles transported over long separations. These different plastics enter the dirt condition, settle superficially, and infiltrate into subsoils.

A few analysts have begun to concentrate on these anthropogenic materials that enter the dirt biological system from different sources. In1998, Habib *et al.* [18] concentrated on manufactured filaments from metropolitan waste water; they discovered synthetic fibers strands got from clothes washers in the sewage sledges, and observed the cloth fibers using polarized light microscopy. They likewise revealed that effluents from waste water plants with definite microfiltration steps contain less synthetic fibers strands than those from wastewater plants without microfiltration. After a long time back, Zubris and Richards [19] conducted

experiments reenacting a few test conditions, checked the quantity of filaments, and proposed composite pictures of manufactured fiber strands separated from slime items. They completed a straightforward test on the extraction of filaments from the oozes. Both of these investigations revealed that the synthetic fiber strands can be transferred to the soil and can pollute soil ecosystem via the application of the effluent to land.

Human health risks due to plastics in the environment

Plastic debris represent a worldwide problem, since they can affect all underground and surface water bodies, with imprevisible and negatively impacts and risks on wildlife, ecological habitats, health of coastal communities. Plastic particles in surface water columns are photodegradable, becoming increasingly smaller (up to molecular level). Toxic substances resulting from plastic degradation (such as bisphenol-A, styrene, phthalates) are then consumed by plankton, thus becoming part of the food chain, reaching humans in the end. It is important to know the impact of absorbing plastic toxins on human health, because plastic micro fragments could be swallowed by small fish, which are the link between plankton and vertebrates [20].

These small fish are eaten by commercial fish such as tuna and swordfish, and substances such as bisphenol A, styrene, etc. could get into the body, hence affecting human health. Bisphenol A and styrene, which are neurotoxic and carcinogenic compounds, can generate disorders to human health.

Effect of plastic pollution on animal health

In confusion for food, animals will feed on plastic waste materials such as polybags and plastic covers [21]. As these plastic materials are toxic, they are held up in the rumen and afterward move to reticulum and omasum [22]. Various pathological conditions are encountered in animals, depending on the type and amount of plastic waste ingested, duration of plastic waste accumulated in forestomach, type of material in plastic waste, and location of this plastic foreign body in gastrointestinal tract [23]. Expressed that acid indigestion, impaction, tympany, polybezoars, traumatic reticulopericardtis, chemical leaching and immunosuppression are the conditions experienced in animals with ruminal impaction because of plastic materials. Apart from these, there is plausibility of event of certain different conditions, for example, substantial metal toxicities, endocrine disturbance, cancer-causing nature, teratogenicity, and urolithiasis due to ruminal impaction with plastic materials in ruminants. Be that as it may, till today these conditions are not detailed [24].

Preventive Measures

At present, most effective way to handle the menace caused by plastic pollution is based on 3R's concept: Reduce, Reuse and Recycle.

Reduce the use of plastics

The most crucial advance in plastic waste administration is by decreasing the amount of plastic waste created in this way plastic contamination will be basically diminished by utilizing less plastics item and change to the next potential choices accessible. According to the reports every year, around five hundred billion to one trillion plastic packs are used around the world. That turns out to more than one million per minute. Billions of plastic bags dumped as waste yearly in landfills. Presently center around another significant part of eco-friendly living cut back your utilization of plastic. Source decrease (Reduce and Reuse) can happen by changing the plan, fabricating process, or diminished the, utilization of plastic items and materials. For instance, the heaviness of a 2-liter plastic soft drink bottle has been sliced off from 68 grams to 51 grams since 1977, bringing about a 250 million pound reduction of plastic every year in the waste stream [10].

Reuse of plastics

It is a second strategy which diverts the plastic waste to reuse side so when we are going to reuse the plastic products it ultimately reduces the final volume of plastic waste generated. Best example is construction of Polymer Blended Bitumen Roads. The non-wetting property of plastics is additionally being enforced with success in road construction business. Bitumen film is commonly stripped off the aggregates due to the penetration of water, which ends up in chuckhole formation. Once compound (plastic waste) is coated over combination, the coating reduces its affinity for water because of non-wetting nature of the compound, thereby obstructing the penetration

of water. Polymers additionally shows higher softening temperature, thereby reduce the bleeding of bitumen during the summers. Due to huge problem of plastic waste disposal, Central Pollution Control Board (CPCB) has taken initiative to use the plastic waste in manufacturing units through co-processing. In co-processing plastic waste materials is used in industrial process such as cement, lime or steel production and power stations or any other large combustion plants. Co-processing refers to substitution of primary fuel and raw material by waste. By this way we can use plastic waste as alternative fuels and raw material. Thus these units save fossil fuel and raw material consumption, contributing the more eco-efficient production [25].

Recycling

It is a third effective approach which diverts the plastic waste for resource or product recovery, which is also environmental friendly and economical. Among existing solutions recycling is one of the most convenient and easiest ways. There are various ways to participate through government programs or programs run by environmental organizations. As consumers, the recycling only requires one easy step of putting plastic wastes in right bins for disposal. Plastic can be recycled in other plastics of the same kind by separating the plastic waste from other waste and by this way we will prevent plastics to be land filled. Recycling techniques can easily deals with the tones of plastic waste that is choking earth. So it is more compatible in addition to developing smarter plastics that takes the place of conventional plastics, there is emergent demand to deal with the immense quantities of plastic wastes already out there and hurting humans and the environment [10].

Alternative solutions

Chemical decomposing

The non-biodegradable property of plastic is the main cause of plastic pollution but chemical decomposing may become a very effective solution to plastic pollution, since. However, till date there is no technology has been developed to effective and cheap large-scale plastic waste utilization facility. But chemical decomposing is still a field that has a great potential to develop in the future. There are mainly two ways to decompose conventional plastics. Decomposing plastics by microorganisms is one of them. However, since this is a relatively new discovery, it is not applied industrially yet. Another way to decompose plastics is by combustion. This is a relatively easy and inexpensive way compared to using microorganisms however, there is a problem of odor and toxic gases produced during combustion [10].

Biodegradable Plastics (BDP)

This is one in all the choices to the conventional plastics. The most common constituents of BDP is polyhydroxyalkanoate (PHA). The BDP are equivalent to ordinary plastics through and through view points with the additional nature of being able to normally degraded and break into natural and safe by products. Hence forth if all plastics inside the town were biodegradable, it could just be permitted to disintegrate with other non-recyclable however biodegradable articles like wet paper and cotton strands [26]. Since the advances to fabricate BDPs are moderately new and not broadly common, the production cost is higher. Along these lines, need of research in the region of more practical and vitality effective assembling techniques for biodegradable plastics is the call of great importance. The consolidation of BDP is a dynamic way to deal with a greener, more beneficial, and a superior situation.

Policy in India

In the course of recent decades, 25 of the 29 states and Union Territories have endeavored to manage and utilization of plastics. India's first endeavor at handling the danger of plastic waste came in 2011 when the legislature told the Plastic Waste (Management and Handling) Rules, 2011. The approach tried to disincentives the utilization of poly bags by setting up an evaluating component for them and furthermore to set up standards for reusing by nearby experts. The Rules were supplanted with a stronger Plastic Waste Management Rules, 2016. The new principles gave accentuation on a total restriction on plastics underneath 50 microns, eliminating utilization of multi-layered packing and introducing extended producer responsibility (EPR) for makers, merchants and brand proprietors to guarantee naturally stable administration of plastic items until the finish of their lives. However, while the usage of the principles were poor and as yet being made sense of, the administration thought of a change to the standards not long ago which has gone a significant path in weakening the impact of the 2016 guidelines. For one, the

standard on express estimating of convey packs which expected merchants to enlist and pay a yearly expense to urban nearby bodies was expelled. The total restriction on "non-recyclable multilayered plastic" which was inferred in the 2016 standards was evacuated through some sharp word play. The expression "non-recyclable multilayered plastic assuming any" has been substituted by "multi-layered plastic which is non-recyclable or nonenergy recoverable or with no other use" giving makers a getaway course by asserting that items can be put to some other use, if not reused. This kind of plastic should be prohibited by March 2018, yet it is not even close to an eliminate. While the administration has guaranteed a few times that it needs to close down all little and illicit plastic creating plants, the correction to the standards appears to weaken this also.

Conclusion

People groups of our nation unwittingly use plastics without knowing its harmfulness. The investigation uncovers that the negative outcomes of plastic on human wellbeing and condition because of introduction to harmful synthetic concoctions discharged by plastic waste. The pollution of seas and earthbound environment by plastics is of concern as a result of the natural effects as well as, they may bargain nourishment security, sanitation and thusly human wellbeing. The administration, law actualizing offices and wellbeing specialists of the nation should make more strides and focus on reasonable generation, use, and transfer of plastics. 3 R's (Reduce, Reuse and Recycling) of plastic waste administration can help in battle against plastic contamination.

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Impact of Public Private Partnership on Efficacy of Health Care Delivery Services

Suresh Kumar Ray

Author's Affiliation: Associate Professor & HOD, Dept. of Community Health Nursing, College of Nursing, Bharati Vidyapeeth (Deemed to be University), Pune, Maharashtra 411043, India.

Corresponding Author: Suresh Kumar Ray, Associate Professor & HOD, Dept. of Community Health Nursing, College of Nursing, Bharati Vidyapeeth (Deemed to be University), Pune, Maharashtra 411043, India.

E-mail: raysureshkumar@gmail.com

Received on 20.05.2019; **Accepted on** 26.06.2019;

How to cite this article:

Suresh Kumar Ray. Impact of Public Private Partnership on Efficacy of Health Care Delivery Services. Journal of Global Public Health. 2019;1(1):35-37.

Abstract

This research was conducted to assess the existence of Public Private Partnership in a district of Maharashtra state. The researcher further explored the extent of support through PPP and its effect of health care delivery services. Mixed method approach was used with the assumption that PPP model have a positive impact on achieving the desired result of health for all. Findings of the study revealed that, PPP model is accepted and implemented at some of the health care establishments in the selected district. Findings also suggested that 60% of the samples believe that PPP model improves service delivery and 70% of the samples suggested that a framework needs to be developed to implement PPP model effectively and efficiently.

Keywords: Public private partnerships; Service; Delivery.

Introduction

Public Private Partnership is a collaborative effort between the public sector and private bodies to achieve the common goal. Public Private Partnership is also gaining the importance in health sector across the world. The need of the Public Private Partnership was arise due to increase in demand of health care services and inability of public sector and private sector body to provide health care services in an effective and efficient manner. India is a developing and progressive country and working extensively towards providing public goods to every common. The progress has been observed in all the sectors including health. But the changing demographic profile and health scenario still post a concern. The high rate of population growth has an adverse affect on health. Morbidity and mortality rate among women and under five children is considerable high in comparison with other small and developing countries. Communicable and non-communicable diseases have still to be brought under control and eradicated.

Problem Statement

An descriptive study to assess the impact of Public Private Partnership (PPP) on the efficacy of Health care delivery services in the selected health care establishments

Research Objectives

1. To identify the extent of support through Public Private Partnership (PPP) from health care establishments.

2. To assess the impact of Public Private Partnership (PPP) on efficacy of health care delivery services.

Assumption

Public Private Partnership may have a positive impact on achieving the desire result of Health for All.

Research Methodology

Mixed Method approach was adopted along with Non experimental descriptive design. Public Private Partnership and Health care delivery services were the two research variables. 50 health care providers were selected from different health care establishments by using non probability convenient sampling method. Among them 10 were medical superintendents, 10 were nursing superintendents and 30 patients were included. An interview schedule and structured questionnaire was developed to collect the data from respondents. Descriptive and Inferential statistics were used to analyze the data gathered from the respondents. Ethical permission was sought from Institutional Ethics Committee.

Results and Discussion

The Interview schedule and the structured questionnaire were very instrumental in getting the information from the respondents. The public private partnership model is gaining momentum and in developing stage. Majority of the respondents (65%) said that health care establishments are thinking positively towards PPP Model of care for the benefits of the patients. 60% of the Medical superintendents, 50% of the nursing superintendents & 70% of the patients were said the PPP model of care is really beneficial for the patients/clients. 75% of the samples were mentioned that the PPP Model of care will bring change in providing the health care services at affordable cost and will be accessible to all. Although 70% of the samples also mentioned that a framework needs to be developed to implement PPP model effectively and.

Conclusion and Recommendation

PPP model is accepted and implemented at some of the health care establishments in the selected district. Findings also suggested that 60% of the samples believe that PPP model improves service delivery and 70% of the samples suggested that a framework needs to be developed to implement PPP model effectively and efficiently.

Acknowledgement

I am extremely thankful to Management of Bharati Vidyapeeth Deemed to be University and Bharati Vidyapeeth College of Nursing, Pune for permitting me to conduct this research study. I would like to extend my sincere thanks to Institutional Ethics committee for giving me ethical approval for conducting this research study. I must thank the authorities and participants of different health care establishments for helping me to complete the research study on time.

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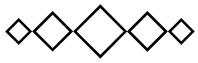

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Journal of Global Public Health (JGPH)
Volume 1 Number 1, January - June 2019

Mental Health and Risk Management of Non Communicable Diseases

Soumya Jacob P[1], Shani T.K.[2] Navya Joy[3]

Author's Affiliation: [1]PhD Scholar, Jain Deemed-to-be University, Bengaluru, Karnataka 560069, India. [3]Lecturer, Aswini College of Nursing, Thrissur, Kerala 680751, India. [2]Assistant Professor, JDT Islam College of Nursing, Calicut, Kerala 673012, India.

Corresponding Author: Soumya Jacob P, PhD Scholar, Jain Deemed-to-be University, Bengaluru, Karnataka 560069, India.

E-mail: soumyarennyjohn@gmail.com

Received on 07.02.2018; **Accepted on** 05.05.2018

How to cite this article:

Soumya Jacob P, Shani T.K., Navya Joy. Mental Health and Risk Management of Non Communicable Diseases. Journal of Global Public Health. 2019;1(1):39-42.

Abstract

Non communicable diseases are fast growing in Indian scenario. Knowingly or unknowingly, certain unhealthy ways of coping up can be a reason for non-communicable diseases. When we are unable to maintain a balance between mind and body system through effective coping strategies, we experience stress. Everyone can deal with stress either through changing the stress producing situations or changing our reaction to stressful situations. Avoid the stressors, alter the stressors, adapt the stressors and accept the stressors are the key area of concern related to stress management. Moreover one should set a powerful mind against alcoholism, smoking and drug abuse. Effective stress management can reduce the risk of non- communicable diseases to some extent.

Keywords: Non-communicable disease; Coping up; Coping strategies; Stress; Stressors.

Introduction

A sound mind in a sound body makes a person happier and healthier. Thus the current era focuses on powerful 'mind–body connection' through which emotional, mental, spiritual, social and behavioral factors can directly affect our health. Knowingly or unknowingly, certain unhealthy ways of coping up can be a reason for non-communicable diseases. When we are unable to maintain a balance between mind and body system through effective coping strategies, we experience stress. Unhealthy ways of coping up, which leads to stress are following: smoking, alcoholism, over eating or under eating, spending more time with computer and excessive use of mobile, withdrawing from friends, family and society, use of excessive sleeping pills, sleeping too much and Projective behaviors (Putting stress on others through angry, outbursts and physical violence)

Everyone experiences stress differently and it influence the health in different ways. Stress in small amount is productive while overwhelmed stress results in certain physical changes in body system through sympathetic activation and parasympathetic deactivation. The impact of such bodily changes for a long period will be renamed

as non-communicable diseases like Diabetes Mellitus, Myocardial Infarction, Hypertension, Dyslipidemia, Arthritis and Asthma. and the list goes on.

How to Balance Your Mind to Defend Against Non-Communicable Diseases?

Deal with stressful situations

Everyone can deal with stress either through changing the stress producing situations or changing our reaction to stressful situations. There are four 'A's which clearly state how to deal with stress, they are Avoid Strssors, Alter Stressors, Accept Stressors and Adapt Stressors. These strategies helps to go away from psychotic, neurotic and psychopathic disorders like depression, anxiety disorders, stress syndromes, eating disorders and mold individual to be strong enough to resist against non-communicable diseases.

Avoid the stressors: There are many unnecessary situations or moments that we persistently take in mind forever, which cause discomfort in our life and deteriorate our body as well as mind. It's better to avoid relationships, which cause extreme tension either by simple negligence or saying 'NO' to them. Let us take tasks which is achievable in terms of

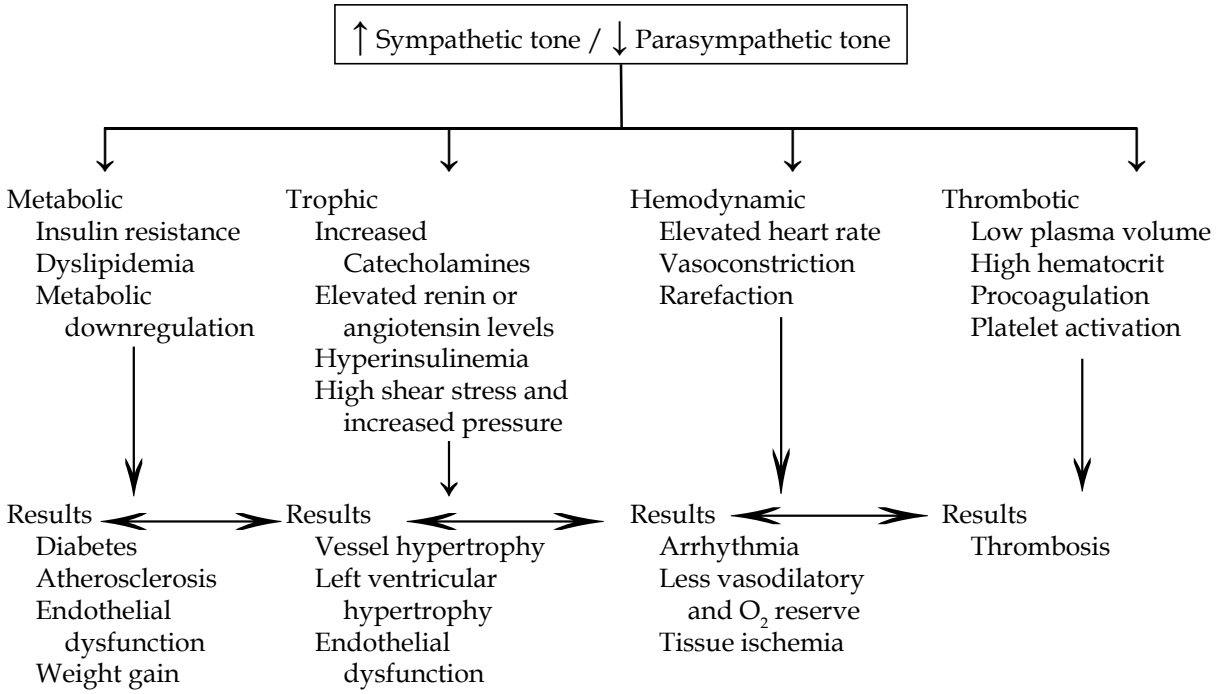
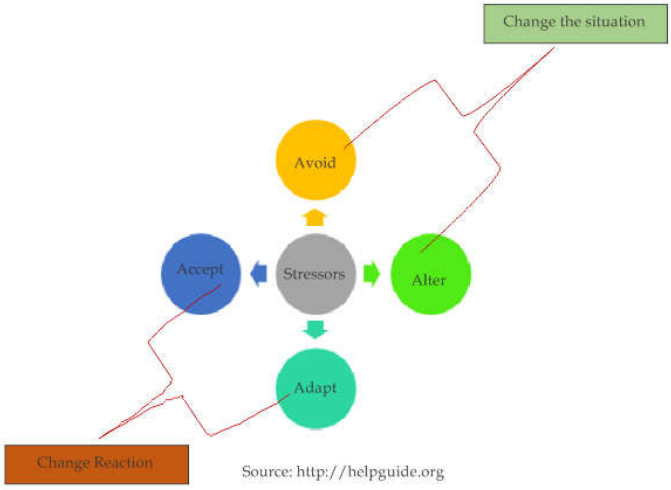


Fig. 1: Concept map on sympathetic activation and parasympathetic deactivation.
Source: http://faculty.washington.edu/chudler/nsdivide.html

Fig. 2:



our ability and availability. Think before promising certain activities and avoid unachievable tasks. Avoid sensitive talks, unpleasant TV programs, busy roads and busy shopping. And find out better alternatives. Prioritize daily activities, do the things which is MUST for us first, than spending time for least priority tasks.

Alter the stressors: Let us try to change our stressful situations through certain tactics in communications and change in mode of operation in daily life. Best methods of changing stressors are through speaking directly to bothering person in an open and respectful way than keeping frustrations in mind. Some behaviors like, poor time management, inability to compromise certain things, lack of flexibility, perfectionism, lack of assertiveness are hidden in us and can act as stressors. Try to change some fixed norms and be stress free to some extent.

Adapt to the stressors: Find out measures to cope up with unavoidable stressful situations. Be realistic in setting goals and divert mind to pleasurable events (for example if traffic jam makes you trouble listen FM music or favorite songs and make the situation enjoyable). Learn to accept things if it's good enough and don't expect excellence everywhere. Try to focus on positives in you and tolerate some sort of discomforts to get something good in future or change your perspectives. Physical exercises, breathing exercises, meditation, music, Yoga, sports, social events, journaling, laugh and fun making and adopting healthy life styles are different ways to cope up with stress in life. Still there are numerous coping measures in different countries suitable to their population.

Accept the stressors: Certain stressors are unavoidable like death of loved ones, chronic illness and natural calamities. Accept the facts. Concentrate on things which is controllable and achievable. Let us change challenges to opportunities, share our feelings to trustworthy, learn from mistakes and forgive many things which is not up to the mark more over try to realize that we live in an imperfect world. Here mistakes are natural. Remember we have to do our best for the events which are controllable like examinations, speech and job interviews.

Set a powerful mind against alcoholism, drug abuse and smoking

Powerful mind against addictions is key to successful life and healthy physic. If we are determinant enough to stay away from dangerous behaviors like alcoholism, smoking and drug dependency, we will be far away from the so called non-communicable diseases. There are some tips to stay away from addictions.

1. *Don't be afraid to say 'NO':* if somebody pressurize to drink, just say 'NO' to them assertively and don't spend time to describe about several reasons behind it.
2. *Avoid negative peer pressure:* it is better to avoid friend circle who can't live without addictive behaviors.
3. *Find ways to make life enjoyable without smoking, alcohol or drugs:* Change the thinking of many who believes alcoholism or smoking are inevitable for a colorful life. We will be happiest in life with certain social, personal and moral values in long run and momentary pleasures play nothing in life than its ill effect.
4. *Adopt stress reduction strategies:* emotional instability is a commonest reason behind alcoholic and smoking behavior of majority of population. Stress reduction strategies in daily life play a pivotal role to live away from substance dependence.
5. *Strong bond with family:* Open communication in family helps to ventilate frustrating feelings in mind and makes one mentally healthy. Thus the need of relaxations through substance can be inhibited.
6. *Avoid all sorts of addictive beverages:* there are many beverages tempts to be addictive in future. These drinks are primary teaching for future alcoholic behaviors. Say buy to those liquids and relay on natural homemade drinks.
7. *Internalize the ill effects of alcoholism, smoking and drugs:* collect maximum information of bad effects of these behaviors to teach ourselves to go away from addictive behaviors. A determinant and self-motivated mind is needed to fight against cravings towards substances and provocations from peers. Knowledge is a powerful force to defend against substance abuse.
8. *Be courageous to declare our non-alcoholic status in public places:* this will help to be a role model in society and take responsibility to maintain self-image in society.

9. *Plan ahead for get together or journey:* Plan ahead in mind that, "I will not be a victim for somebody else's alcohol or drug abuse". We won't be an addictive until and unless our mind permits.
10. *Get support:* Whenever we feel weak in mind and think some sort of CNS depressants are needed for relaxation, remember there are many counselling centers throughout the world to help you from depressive feelings along with your family members and good friends. Seek help and be strong.

Many research studies shows a stress-free mind relax our organs and maintain our cells positive and productive. Let us fight against non- communicable disease with strong and solid mind.

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Journal of Global Public Health (JGPH)
Volume 1 Number 1, January - June 2019

Acute Encephalitis Syndrome in India: Current Issues and Challenges

VT Krishnadas Menon

Author's Affiliation: Assistant Professor, Department of Community Medicine, Amala Medical College, Thrissur, Kerala 680555, India.

Corresponding Author: VT Krishnadas Menon , Assistant Professor, Department of Community Medicine, Amala Medical College, Thrissur, Kerala 680555, India.

E-mail: vtkmenon@gmail.com

Received on 22.05.2019; **Accepted on** 29.06.2019;

How to cite this article:

VT Krishnadas Menon . Acute Encephalitis Syndrome in India: Current status, Issues and Solutions. Journal of Global Public Health. 2019;1(1):43-46.

Abstract

AES was a term introduced in 2008 by the World Health Organization to strengthen the surveillance and research of AES in India. AES is characterized by high case fatality rate particularly of children below 15 years. Clinically presents with fever and altered consciousness and rapid worsening of the condition often leading to death. Japanese encephalitis virus (JEV) is the leading diagnosed cause of acute encephalitis, other causes include enteroviruses, scrub typhus, and other viruses circulating in the local area. In many cases, however, no etiological agent is determined, and such cases are categorized broadly as acute encephalitis syndrome (AES). It has been in recent years a pressing public health emergency in India.

Keywords: Encephalitis; Syndrome; fatality; neurologic.

Introduction

Acute Encephalitis Syndrome (AES) manifests with a wide group of neurologic manifestation caused by a wide range of viruses, bacteria, fungus, parasites, spirochetes, chemical and toxins. AES is reported mainly from Assam, Bihar, Karnataka, Uttar Pradesh and Tamil Nadu which contributes approximately 80% of cases and has high case fatality rate reported almost every year.

History

The history of AES has been classified based on various surveillance reports and outbreak of the first phase being prior to 1975 when there were a few cases. The second phase between 1975 and 1999 when there were more cases reported particularly in the Gangetic plains and the third phase from 2000 to 2010 which saw the emergence of many other causes of AES other than Japanese Encephalitis which included viruses like Chandipura virus and Nipah virus [2].

Several endemic regions of various viruses reported to cause AES in India. JEV has its endemic zones running along the Gangetic plane including states of UP (east), Bihar, West Bengal and Assam, and parts of Tamil Nadu.

Chandipura virus on the other hand made its arrival in Maharashra and Eastern Gujarat in 2003 but also has seen activity in Andhra Pradesh. Nipah virus hit the south-east Asian countries, mainly Bangladesh. It had its first outbreak in Siliguri, West Bengal in 2001. Nipah virus again caused

an outbreak in Nadia district of West Bengal in 2007 and more recently in 2018 in Kerala and also 2019 again in Kerala. The so called Litchi virus was the latest virus in the list that caused AES in Muzzafarpur, Bihar and Malda, West Bengal from 2013 to 2014.

Definition

Acute encephalitis defined as the acute onset of fever and a change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk), and/or new onset of seizures (excluding simple febrile seizures).

Japanese encephalitis is vector borne disease that is usually spread by Culex mosquitoes and the transmission cycle is maintained by mosquitoes, pigs and Ardeid birds.

Prevalence

The outbreak of JE usually coincides with the monsoon and post monsoon period when the density of mosquitoes increases while encephalitis due to other viruses specially enteroviruses occurs throughout the year. The case fatality and morbidity is very high among various viral encephalitis specially in JE or entero virus encephalitis in various parts of India.

The first reported Japanese encephalitis was reported from Vellore in Tamil Nadu in 1955. Subsequently the first outbreak was reported from Bankura in West Bengal in 1973 [1]. Since then there have been several sporadic outbreaks across India Thereafter, sporadic cases of AES and outbreaks have been the leading cause of premature deaths due to the disease in India.

AES in Gangetic belt

Between 2008 and 2014, there have been more than 44,000 cases and nearly 6000 deaths from encephalitis in India, particularly in Uttar Pradesh and Bihar. In 2016, there has been a rise in encephalitis, with over 125 children deaths in one hospital in Gorakhpur, Uttar Pradesh alone Gorakhpur had successive outbreaks in 2005, 2006 and 2007 and also in 2017.

In 2006 there were 6061 cases with 15000 deaths while in 2007 there were 2320 cases with 528 deaths and in 2007 there were 3024 cases and 645 deaths with 1500 deaths. It was followed by further outbreaks in 2006 and 2007, with 2320 cases and 528 deaths and JEV was identified as the causative agent in some cases, while in some studies, besides scrub typhus *Enterovirus* was identified as the infective agent. This led to India launching a JE vaccination programme in 2006, which in 2014 became part of the National immunization programme [13]. The programme now makes the vaccine available in 179 districts in nine States where the disease is highly prevalent epidemics of encephalitis of unknown aetiology have occurred in the country.

Epidemiology

The neighbouring State of Bihar, particularly Muzaffarpur district, has been reporting cases of acute encephalitis among children since 1995. In 2011, there were 147 cases and 54 deaths (CFR 36.7%) in the district. In the following year, 469 cases and 178 deaths were reported from health facilities with CFR of 38.6 per cent [14].

Agent

Litchi is a fruit belonging to the soapberry family and is found mainly in India and China. In 1962, it was found that lychee seeds contained methylene cyclopropylglycine (MCPG), a homologue of hypoglycin A, which caused hypoglycemia in animal studies. Unripe fruit contain the toxins hypoglycin A and methylene cyclopropyl glycine (MCPG), which cause vomiting if ingested in large quantities. Hypoglycin A is a naturally occurring amino acid found in the unripe litchi that causes severe vomiting quite similar to what occurred in Jamaica after eating unripe ackee fruits (Jamaican vomiting sickness).

Host

The age of the hospitalized cases ranged from six months to 16 yr with 92 per cent below the age of 10 yr. [2]. In 2018 again there were more than 125 deaths from Muzaffarpur alone [3].

Clinical Manifestation

The clinical presentation in the Muzaffarpur epidemic included sudden onset of convulsions with clenching of teeth and loss of consciousness, mostly in the early morning, with no prodrome or sequelae. Many of them did not have fever.

Hypoglycaemia was a common feature (50% of the observed cases). The serum and cerebrospinal fluid examinations were, however, inconclusive. On an average, one case was seen per village. All cases occurred during May and June, which coincided with the litchi plucking season in the district.

While MCPG is a poisonous compound found in litchi seeds that causes a sudden drop in blood sugar, vomiting, altered mental states leading to lethargy, unconsciousness, coma and death. These toxins cause sudden high fever and seizures serious enough to require hospitalisation in young, severely malnourished children. It is postulated that eating of unripe fruits on an empty stomach in children leads to this disease.

Issues and Challenges

There are many causes of AES while Japanese encephalitis was a major cause of AES it is now the only cause. However, since it is a major cause, vaccination of all children in endemic zones 181 districts have been brought under this scheme.

In Gorakhpur in Uttar Pradesh in addition to Japanese Encephalitis scrub typhus caused by Oriental mite Orienta Tsutsugamushi is a major cause [4,5]. While the vaccination campaign against Japanese encephalitis by the Government of India has reduced the number of cases to a large extent. lot more needs to be done regarding the occurrence of scrub typhus.

In the very recent Muzaffarpur outbreak of 2019 killing more than 121 children. Some studies point to the possible link with litchi fruits in Muzaffarpur, Bihar, since the outbreaks occur in litchi fruit growing region in India, and cases tend to peak during litchi harvesting season Besides India, outbreak reports from Vietnam and Bengal also suggest that litchi-associated encephalitis can occur following consumption of litchi fruits, which contains hypoglycin A and methylene cyclopropylglycine (MCPG) [3,6,7].

However a study from Bangladesh suggests that it is not litchi but pesticides sprayed on it that cause the disease [8]. Among the pesticides mentioned in the study in Bangladesh are cypermethrin, endosulfan.

Other causes attributed to Muzaffarpur outbreak also include lack of evening meal, and malnutrition and the extreme heat.

While there were recommendation for children to have their evening meals before sleeping but this was not followed. However there is no evidence of malnutrition in Muzaffarpur being higher than the rest of Bihar.

Conclusion and Recommendations

There are several causes of AES and several risk factors. While in Gorakhpur Uttar Pradesh scrub typhus has been proven to be a a major cause in addition to Japanese encephalitis the situation is different in Muzaffarpur in adjoining Bihar where consumption of lytchee fruit along with malnutrition and extreme heat have been suggested as possible factors [10,11].

While vaccination can reduce the burden of Japanese encephalitis, environmental control is also needed to reduce incidence of scrub typhus and other vector borne diseases [10].

Good nutrition and health education in addition to strengthening infrastructure is also the need of the hour. While the role of pesticides is not confirmed it may be useful to check their toxicity if any.

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