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Update on ORS Usage in Pakistan: Results of a National Study

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Abstract: Diarrhea disease continues to rank as one of the leading causes of child mortality throughout the world. It is estimated that 1 billion episodes of diarrhea occur in young children each year, The World Health Organization has recommended the use of oral rehydration solution (ORS) for the treatment of dehydration associated with diarrhea. Numerous studies have documented the effectiveness of ORS in treating diarrhea and reducing mortality. Diarrheal disease in Pakistan has been identified as the major cause of child mortality in Pakistan, accounting for an estimated 200,000 - 300,000 deaths each year. This paper reports the results of a nationwide survey conducted in Pakistan to obtain information regarding the practices of mothers concerning child health care and factors that influence these practices. The purpose of the survey was to collect baseline data on a variety of issues, in order to develop effective health education programs and evaluate ongoing ones. Within the context of two theoretical models (diffusion of innovation and stages of change), adoption practices of the population with respect to use of ORT treatment are described and assessed. These results pose new challenges to health care professionals in their ability to influence and persuade adoption of effective public health practices. Recommendations are provided as how to modify the misconceptions of mothers with young children in the treatment of diarrhea.

Key Words: ORS, diarrhea, theory, behavioral determinants

Introduction
Diarrhea is one of the leading causes of child mortality in many developing countries. It is estimated that diarrheal diseases cause 3.3 million deaths annually among children under the age of five in the developing world (Bern *et al.*, 1992), accounting for 23% of child mortality worldwide. An estimated 1 billion episodes of diarrhea occur in young children each year, equivalent to 2.6 episodes per child per year (Bern *et al.*, 1992; Gadomski *et al.*, 1988).

Diarrhea in developing countries is caused by a variety of bacterial, viral, and parasitic pathogens; some of the most common are rotavirus, *E. coli*, campylobacter, shigella, and salmonella (Taylor, 1993). The health consequences of frequent or persistent diarrhea can be severe, including malnutrition and impaired growth and development (Chen and Scrimshaw, 1983). Moreover, diarrhea can be viewed as both a cause and an effect of malnutrition since it can be difficult to determine whether diarrhea precedes malnutrition of vice-versa in individual cases (Walker-Smith, 1993). Diarrheal episodes can lead to a dangerous spiral of illness because diarrhea impedes growth and malnutrition increases the frequency of diarrhea (Guerrant *et al.*, 1992).

The World Health Organization recommends the use of oral rehydration solution (ORS) for the treatment of dehydration associated with diarrhea (WHO, 1991). Numerous studies have documented the effectiveness of ORS in treating diarrhea and reducing mortality (WHO, 1997; Varavithya *et al.*, 1991; Richards *et al.*, 1993). ORS is particularly appropriate for the treatment of diarrhea in the developing world because it is inexpensive and can be administered in the home.

Improved use of ORS in conjunction with appropriate feeding practices could markedly reduce the morbidity and mortality associated with diarrhea. For this reason, ORS education and distribution programs have been implemented throughout the world, increasing the availability, accessibility and afford ability of ORS (Merson, 1986). Yet despite the widespread availability of ORS, many mothers continue to use alternative therapies to treat childhood diarrhea or they use ORS incorrectly (Merson, 1986; Hudelson, 1993; Mull *et al.*, 1988).

Many factors contribute to the failure of some populations to adopt ORS, but one of the most important is a paucity of social support for the behavior. Cultural beliefs and practices may encourage the use of traditional therapies, and disagreement among health care providers about which treatment is best may further impede the adoption of oral rehydration therapy in some societies. The inappropriate use of antibiotics to treat diarrhea has become commonplace in many developing countries because doctors continue to prescribe them unnecessarily, many women believe this is the only appropriate treatment for illness (Hudelson, 1993).

Modern pharmaceuticals are readily available without a prescription in many developing countries. A study in the Philippines demonstrated that most childhood illness were treated without the advice of a physician, yet half of these treatments involved the use of pharmaceuticals (Hardon, 1987). Another study in India showed that, even when physicians were consulted, prescription practices were inappropriate and sometimes dangerous (Greenhalgh, 1987). Paredes *et al.*, 1996 identified physician prescribing practices for Peruvian mothers who brought their children to the health center for diarrheal management. Most physicians reported that family members usually expect to receive a prescription when they visit a physician. If a prescription is not given, the physician would be considered to lack experience or to 'know nothing about treating diarrheal disease'. Furthermore, mothers who reported receiving 'only' ORS left the consultation often unhappy or frustrated. They reported that this was because they did not receive a prescription but only ORS (Paredes *et al.*, 1996).

ORS promotion in Pakistan: Diarrheal disease in Pakistan has been identified as the major cause of child mortality in Pakistan, accounting for an estimated 200,000 - 300,000 deaths each year (Lambert, 1986). Nearly 50% of child hospital admissions are related to diarrhea. Furthermore, a recent survey found that 14.5% of children under the age of 5 years had experienced an episode of diarrhea during the preceding 24 hours (UNICEF, 1991). Rates were highest among children under one year of age, and declined steadily with age. The need to promote appropriate treatment of diarrhea, especially in young children, is clear.

In 1984, the Government of Pakistan launched a program to control diarrheal diseases (CDD). The program has promoted the use of ORS through an intensive public health education campaign. Previously conducted surveys have indicated that knowledge concerning ORS has been steadily rising, from 38% in 1984 to more than 85% in 1987 (ORS-KAP Survey, 1987). However, while
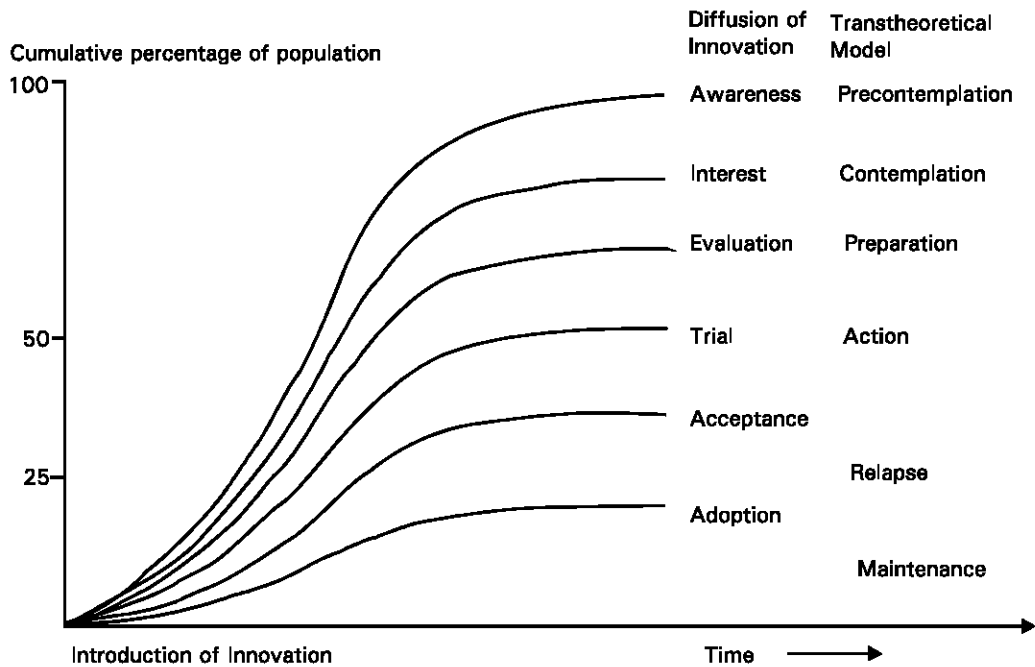
Fig.1: An integrative model of diffusion of innovation and the transtheoretical model

awareness of ORS remains high, ORS use lagged significantly behind. A nationwide survey of about 5000 Pakistani households commissioned by the Pakistan Ministry of Health in 1987 found that 90% of those interviewed knew that a 1-liter packet of ORS should be mixed with 1 liter of water. However, detailed questions regarding the preparation and administration process were not asked. Mull and Mull (1988) state that WHO's current estimate that ORS is being used `effectively' by 80% of diarrhea cases is much too optimistic, at least for Pakistan.

Theoretical framework: The Diffusion of Innovation Model provides a useful framework for examining the adoption of ORST in Pakistan. This model categorizes individual behavior change into five stages: awareness, interest, persuasion, decision, and adoption (Rogers, 1971). Individuals pass through these stages and adopt new behaviors at different rates. The model classifies these different rates of adoption by dividing the population into five groups: innovators, early adopters, early majority, late majority, and laggards (Rogers, 1971). When a new behavior is introduced into a population, the cumulative curve follows an S-shaped rate of adoption, as more individuals reach the fifth stage and adopt or internalize the new behavior.

The Diffusion of Innovation Theory is closely linked to the Transtheoretical Model of behavior change (Prochaska *et al.*, 1984). Prochaska and DiClemente have identified five stages of change through which an individual must pass before achieving behavior change precontemplation, contemplation, preparation, action, and maintenance. Both Diffusion of Innovation Theory and the Transtheoretical Model are based on the assumption that individuals pass through several stages before successfully achieving behavior change. The major distinction between these two models is that the Transtheoretical Model limits examination of behavior change to the individual level, while Diffusion of Innovation goes beyond the individual to describe behavior change in a population. The Transtheoretical Model has traditionally been used to analyze the cessation of addictive behavior from a psychological perspective. However, if the Transtheoretical Model is expanded and viewed from a community/public health perspective, the two theories appear to have many shared components. Rogers has conceptualized the characteristics of an

innovation, as perceived by the members of a social system, which determine its rate of adoption. These factors include relative advantage, compatibility, complexity, trial ability and observ ability. A more recent health education and health promotion diagnostic framework (PRECEDE/PROCEED) developed by Green and Kreuter, 1999 addresses these issues and identifies specific factors in the adoption process, including various predisposing, enabling and reinforcing factors which can help explain why mothers do not translate their knowledge of ORS into taking action. Fig. 1 presents the comparative features of these two theoretical constructs and potential linkages of stages of behavioral change in the models. The current study presents an opportunity to link and test these two classical models with empirical data.

Background of Pakistan: Pakistan is the seventh most populous country in the world, with an estimated population of 125 million in 1995. The country is divided into five provinces. Punjab is the most densely populated with 55% of the population, followed by Sindh with 22% of the population. The two least populous provinces are North West Frontier Province (NWFP), with 13% of the population, and Balochistan, with 5%. Approximately 70% of the population is rural, and 90% is Muslim.

In 1991 and 1992, a nationwide survey was conducted in Pakistan to obtain information regarding the practices of mothers concerning child health care and factors that influence these practices. The purpose of the survey was to collect baseline data on a variety of issues, in order to develop effective health education programs and evaluate ongoing ones. Several of the survey questions addressed knowledge, attitudes, beliefs and practices regarding ORS. Several other questions were designed to gather information about the respondents' sources of health information. Taken together, these two components of the survey can help to direct the development of an anti-diarrhoeal treatment/ prevention program in Pakistan.

Materials and Methods

The Pakistan Health Education Survey (PHES) was conducted throughout the entire country during October 1991 and February 1992. The major objective of the survey was to collect

Table 1: Number and Percent of Primary Sampling Areas(PSUs) by Urban and Rural Areas and Total Sample Size

	Urban	Rural	Total	Total Sample Size
Province/Area				
Punjab	48	72	120	2400
Percent	40	60	45	
Sindh	30	30	60	1200
Percent	40	60	22	
N.W.F.P.	16	24	40	800
Percent	40	60	15	
Balochistan	12	18	30	600
Percent	40	60	11	
AJK	8	12	20	400
Percent	40	60	7	
TOTAL	114	156	270	5400
Percent	42	58	100	

information on health-related knowledge, attitudes, and maternal and child health concerning practices of women with children under two years of age. This information will provide baseline data on which to initiate new programs as well as to evaluate ongoing health education and service delivery activities.

The design for this survey is a stratified, clustered and systematic sample of households. The universe consists of all urban and rural areas of the four provinces of Pakistan and Azad, Jammu and Kashmir (AJK), defined as such by the 1981 Population Census. The universe excluded military restricted areas, areas of D.G. Khan District, Kohistan, Chitral and Malakand Districts as well as the Federally Administered Tribal Areas (FATA), because of governmental restrictions and safety of visiting health nurses. The population of these excluded areas constitute approximately 4 percent of the total population. The population of the survey covers mothers with children 2 years of age or less and is estimated to be between 6-7 percent of the total population of 120 million.

Sampling frame-urban domain: The sampling frame for the urban domain consists of lists of enumeration blocks provided by the Federal Bureau of Statistics. Each city or town had been divided into a number of small areas called Enumeration Blocks. Each Enumeration Block is a compact area consisting of 200 to 225 households on the average with well-defined boundaries recorded on the prescribed forms. Each Enumeration Block is demarcated on the map with physical features describing the locality and physical features.

Sampling frame-rural domain: The sampling frame for rural domains consists of all mouzas/dehs/villages prepared by the Population Census Organization as a result of the 1981 Population Census. A mouza/village/deh is the smallest revenue estate identified by its name.

Several factors were considered in determining the sample size of the survey, including: the main objectives of the survey, level of estimate, acceptable level of error in the estimate, proportionality of study population, strata/sub-strata requirements, minimum number of observations, time and resource constraints, and coverage problems. Table 1 presents the distribution of samples in the urban and rural domains of the four provinces and AJK according to the Primary Sampling Area (PSU). Approximately 20 households were surveyed within each PSU.

The total sample size of 5,400 eligible respondents (women having children equal to or less than 2 years of age) was expected to provide valid reliable estimates at national level of key variables with a +/- 5% coefficient of variability at the 95% confidence level.

Stratification Plan: In consideration for the level of estimates desired and required heterogeneity in the population, stratification has been done according to self-representing cities, by urban and rural areas. Cities having populations of 500 thousand and greater

according the 1981 population census, namely Karachi, Lahore, Faisalabad, Gujranwala, Rawalpindi, Multan, Hyderbad and Peshawar have been taken as self-representing cities. Islamabad, the national capital and Quetta, a provincial capital have been specially considered as a self-representing city (SRC). Each of the SRC's constitute an independent or explicit stratum. After excluding the population of SRCs from the respective districts of a province, the remaining urban population in each division of the Punjab, Sindh, N.W.F.P. and Balochistan Provinces have been grouped together to form another stratum in all the four provinces of Pakistan. Each SRC was further divided into three sub-strata according to low, middle and high income groups based on the information collected from each Enumeration Block at the time of demarcation and updating of the urban sampling frame. Rural populations of each District in the Punjab, Sindh, and N.W.F.P. Provinces have been grouped to form a stratum. For Balochistan Province, each division has been considered as a stratum.

Sample Design: A two-stage stratified sampling design was adopted for the survey. The sample PSUs from each urban stratum were selected with a probability proportional to the number of households. The sample PSUs from each rural stratum were selected with a probability proportional to the population enumerated in the 1981 census. The second stage of sampling consisted of selection of households in the selected cluster, done on a random basis. Standardized sampling procedures were used to identify households in each cluster. The interview team went into the middle of the cluster and through a randomized procedure determined the starting quadrant for the first household. The first house was selected by the first digit of a currency note. Thereafter, each door was approached to find an eligible respondent.

Questionnaire: The PHES questionnaire was developed by a multi-disciplinary team of experts from the Ministry of Health, including health education experts, members of the Federal Communication Advisory Group, program managers of various categorical programs (TB Control, Expanded Program on Immunization, Center for Diarrheal Disease, etc.), international agencies, and technical experts. The questionnaire was translated into the national language, Urdu, and pre-tested prior to its implementation. The content areas of the questionnaire included background socio-demographic characteristics, breast feeding practices, knowledge, attitudes and practices concerning diarrhoea, immunization, malaria and smoking. Questions concerning knowledge about AIDS, and its routes of transmission were also asked of each respondent.

Recruitment, Training and Fieldwork: Health education supervisors from each of the four provinces and AJK were trained during a three-day session in the Ministry of Health, Islamabad. These 17 individuals were instructed in the techniques of interviewing, probing, and monitoring. Regional training was conducted in five areas of the country, in which health education supervisors trained a total of 64 lady health visitors who conducted the interviews with the mothers. All interviewers were female. The fieldwork began in November 1991 and concluded in February 1992. A 10% random sample of interviews were field checked by the health education supervisor following each days work. Throughout the survey, health education staff in Islamabad monitored closely all 16 teams by direct communication and spot checking. All questionnaires were transcribed to data coding sheets by field supervisors and express mailed to Islamabad for data entry. Coding sheets were also randomly checked with the original questionnaires and incorrect entries were less than 0.1%.

Data Entry and Cleaning: All data were entered an IBM personal computer using an SPSS-PC Data Entry II software program

Table 2: Demographic Characteristics of the Sampled Population

Demographic Data	N	Percent
TOTAL	5433	100.0%
Province		
Punjab	2406	44.3%
Sindh	1176	21.6%
N.W.F.P.	812	14.9%
Balochistan	640	11.8%
AJK	399	7.3%
Residence		
Rural	3167	58.3%
Urban	2266	41.7%
Age		
15 - 19	196	3.6%
20 - 24	1063	19.6%
25 - 29	1842	33.9%
30 - 34	1303	24.0%
35 - 39	740	13.6%
40 - 44	236	4.3%
45 - 49	53	1.0%
Education		
None	3953	72.8%
Primary	574	10.6%
Middle	298	5.5%
> =Secondary	608	11.2%
Monthly Income		
< RS 1,000	1727	31.8%
RS 1,000 - 1,999	1613	29.7%
RS 2,000 - 3,499	1018	18.7%
RS 3,500 - 4,999	346	6.4%
> RS 5,000	293	5.4%
Don't Know	436	8.0%

which allows the identification of each variable, its value, and a value range to signal incorrect entries. Frequency distributions of all variables identified outlier which were confirmed by examining the original questionnaire. Logic checks were performed on all meaningful variables to identify incorrect entries. Data were analyzed using a mainframe IBM computer, with SPSS statistical software programs.

Results

Socio-demographic Characteristics: Table 2 presents the frequency and percent of various socio-demographic characteristics of the surveyed. A total of 5433 women were interviewed throughout the five provinces population, 33 individuals more than the minimal sample requirements. The largest surveyed area was Punjab with 44.3% of the total sample. The respondents are not proportionate to the population of provinces and area of residence (Urban:Rural) in order to maximize the homogeneity and heterogeneity of populations in different provinces and areas of residence. The urban population constituted approximately 40% of the sample and the rural population constituted approximately 60%. The mean age of the population was 26.5 with the largest number of respondents (33.9%) falling into the age group 25-29 years followed by 24% belonging to the age group 30-34. A total of 72.8% of the respondents have no education, 10.6% have attained primary education, 5.6% have gone to middle level and 11.2 % secondary and above. Thirty-two percent of the households have less than Rupees 1000 monthly ($40) income which can be considered below the poverty line.

Awareness of ORS: Knowledge is often considered to be a necessary but not sufficient condition for behavior change. Shea and Basch's review of five major community cardiovascular disease prevention programs highlighted the significance of knowledge transfer and innovation diffusion as the most important link in the causal chain of adoption behavior (Shea and Basch, 1990).

Table 3: Percent of Best Treatment for Diarrhea, by Province, Residence, Age and Education

	Home Liquids	ORS	Home liquids and ORS	Drugs	Don't know
PAKISTAN	8.2	40.5	7.3	39.7	4.3
Province					
Punjab	9.0	28.9	9.9	47.5	4.7
Sindh	5.7	42.9	4.0	44.0	3.4
N.W.F.P.	4.8	50.5	11.7	29.8	3.2
Balochistan	14.2	35.9	2.2	39.4	8.3
AJK	7.5	90.5	0.0	0.5	1.5
Residence					
Rural	9.8	38.5	5.1	41.2	5.4
Urban	5.8	43.4	10.2	37.6	3.0
Age					
15-19	7.7	41.3	10.7	30.1	10.2
20-24	7.5	39.7	9.9	38.3	4.6
25-29	7.5	43.3	6.2	39.0	4.0
30-34	8.5	41.4	5.0	41.2	3.9
35-39	9.5	35.8	7.4	43.4	3.9
40-44	10.2	33.5	11.0	40.3	5.0
45-49	9.4	34.0	13.2	35.8	7.6
Education					
None	8.9	37.3	6.2	43.3	4.3
Primary	5.7	49.1	8.4	32.9	3.9
Middle	6.0	49.0	11.4	29.9	3.7
> =Secondary	6.9	49.5	11.2	29.3	3.1

Awareness of ORS was high for most respondents in the survey. Overall, 91% of mothers responded that they had heard of ORS. There was some variation by province 81.4% of respondents had heard about ORS in Balochistan compared with 97.7% in AJK. Education, income, and urban residence were all positively associated with awareness of ORS. This is a significant increase from 1984 when only 38% of mothers had heard about ORS (National Nutrition Survey 1985-1987, 1988).

Knowledge of Treatment for Diarrhea: Table 3 presents comparisons of knowledge of treatment for diarrhea by education, income, and residence. When asked about the best treatment for childhood diarrhea, 56% of mothers identified oral rehydration therapy (ORT), while 39.7% stated that drugs were the best treatment. Variability between provinces was significant, with 90.5% of respondents in AJK answering correctly and only 28.9% responding correctly in Punjab. The higher level of knowledge among AJK residents is attributed to recent information campaigns conducted in this area. These results indicate a significant gap between awareness and knowledge. Although 91% of mothers know about ORS, only 57% believe it is the best way to prevent diarrheal dehydration.

Use of ORS: Actual use of ORS is even lower than knowledge. Only 34.7% of mothers gave ORS to their infants during their last episode of diarrhea. Another 22.9% responded that their infant was treated in the hospital. Other responses included antibiotics (11%), other pills or syrups (9.2%), and home remedies (6.8%). These results support the findings of previous studies in Pakistan which have found that practice of ORT has consistently lagged behind knowledge.

Availability of ORS in the home: Mothers who reported knowing about ORS were asked if they had a packet of ORS at home. Only 27.5% of these mothers responded in the affirmative. Income, education, and age of the mother were all predictive of having ORS in the home, with wealthier, more educated, and younger women being more likely to have it. To verify their responses, the mothers who indicated that they had ORS at home were asked to show the ORS packet to the interviewer. Over 90% of these women were able to produce the ORS packet.

Table 4: Respondents who continued giving food when child had diarrhea by Province, Residence, Age, Education, Income level

Demographics	Continued N = 4,487	Discontinued N = 318	Reduced N = 335	DK N = 293	% valid	N
PAKISTAN (Total Percent)	82.6%	5.9%	6.2%	5.4%	100.0%	5,433
Province						
Punjab	82.6%	3.7%	4.7%	9.1%	100.0%	2,406
Sindh	78.9%	8.1%	12.4%	0.6%	100.0%	1,176
N.W.F.P.	79.3%	8.3%	6.2%	6.3	100.0%	812
Balochistan	83.7%	9.8%	4.1%	2.3%	100.0%	640
AJK	98.2%	1.3%	0.3%	0.3%	100.0%	399
Residence						
Rural	84.2%	4.6%	5.3%	6.0%	100.0%	3,167
Urban	80.4%	7.6%	7.4%	4.6%	100.0%	2,266
Age						
15-19	77.0%	5.1%	4.1	13.8%	100.0%	196
20-24	81.0%	6.3%	6.2	6.5%	100.0%	1,063
25-29	83.3%	5.6%	5.9	5.1%	100.0%	1,842
30-34	83.3%	6.3%	6.0	4.5%	100.0%	1,303
35-39	82.7%	5.8%	7.2	4.3%	100.0%	740
40-44	84.7%	4.2%	7.6	3.4%	100.0%	236
45-49	81.1%	3.8%	5.7	9.4%	100.0%	53
Education						
None	82.7%	6.1%	6.0%	5.2%	100.0%	3,953
Primary	81.7%	5.2%	6.1%	7.0%	100.0%	574
Middle	81.5%	7.7%	5.0%	5.7%	100.0%	298
> =Secondary	82.9%	4.1%	7.7%	5.3%	100.0%	608
Monthly Income						
RS < 1,000	82.5%	4.1%	6.3%	7.2%	100.0%	1,727
RS:1,000-1,999	83.3%	5.7%	6.4%	4.6%	100.0%	1,613
RS:2,000-3,499	83.8%	5.7%	6.0%	4.5%	100.0%	1,018
RS:3,500-4,900	85.8%	4.9%	6.9%	2.3%	100.0%	346
RS > 5,000	88.1%	3.1%	4.8%	4.1%	100.0%	293
DK *	71.6%	16.5%	5.5%	6.4%	100.0%	436

* DK : Do Not Know

Feeding Practices During Diarrhea: Studies conducted during the early 1980s found that the majority of mothers stopped giving food and/or liquids to the child during diarrheal episodes. For example, before the CDD campaign, only 40% of mothers continued giving food and liquids during diarrhea. Failure to provide food and liquids is an extremely dangerous practice because it accelerates dehydration and denies the child essential nutrients. As part of the CDD program, a massive public health campaign was launched to encourage mothers to continue feeding during diarrheal episodes. An evaluation of the CDD program undertaken in 1988 indicated that an increasing proportion of mothers - 59% - were continuing to give food and liquids to their children during diarrhea. These results are confirmed by the PHES survey.

In response to a question about feeding practices during diarrhea, 82.6% of mothers indicated that they continued to provide food for the child. Feeding practices differed between provinces 98% of mothers in AJK reported continuing food, while lower levels of 79% were found in Punjab and Balochistan. Feeding practices did not differ significantly with respect to income, education, or age of the mother. Table 4 provides a more detailed description of the factors found to be associated with feeding practices.

Since dehydration is the biggest risk associated with diarrhea, the continuation of liquids is essential to recovery. This study found that most mothers, 90.8%, continue to give liquids when their child has diarrhea. The urban-rural differential was small, but there was significant variability according to age. Young mothers, 15-19, were least likely to continue providing liquids compared to older mothers.

Multi variate analysis: Several variables were found in the bivariate analyses to relate significantly with the use of ORT as the best treatment of diarrheal disease. These variables were entered into a logistic regression model with the dependent variable being "perceived best way to prevent diarrheal dehydration" (1 = ORS + both ORS and home remedy and 0 = others). These independent variables included the number of individuals consulted for child health, mother's education, mother's age (continuous variable), number of household appliances (continuous variable), residence (rural or urban), and income (< = RS 1999 = 0; > RS 2000 = 0). Together, these six variables accounted for 62.6% of the variability in the identification of ORS as the best way to prevent diarrheal dehydration. Table 5 presents the results of the logistic regression. All independent variables except number of health consultants were found to be significantly associated with ORS as the best treatment. Mothers with more appliances in the household (such as radio, television, etc.) are 30% more likely to perceive ORS as the best way to prevent diarrheal dehydration. Mothers whose household income < = RS 1999 are 40% more likely to perceive that ORS and home remedy are the best ways to prevent diarrheal dehydration in comparison to those from higher income.

A second logistic regression model was used to assess the influence of several variables on "mother used ORS during the last episode of diarrhea" Independent variables entered into the model included mother-in-law as a consultant for child's health, doctor as a consultant for child health, residence, mother's age, reading newspaper, and income level. Together, these six variables accounted for 62.6% of the variability in using ORS during the last episode of diarrhea. Mothers who indicate that the mother-in-law was identified as a consultant for the child's health are 42% more likely to use ORS during the last episode of diarrhea compared to individuals who do not use a mother-in-law as a consultant. Also, mothers who read the newspaper are 32% more likely to use ORS

Table 5: Logistic Regression Analysis for Feeding Pattern for Children, Pakistan National Health Education Survey 1991-92

Variable	B	S.E.	Wald test	Significance	R	Exp(B)
Area of residency	− 0.10	0.074	1.93	0.165	0.00	0.90
Mother's age	− 0.02	0.006	13.63	0.0002	− 0.05	0.98
Mother's education *						
- no education	0.94	0.112	71.15	0.000	0.11	2.56
- primary education	0.64	0.124	26.29	0.000	0.07	1.89
NO. of consultants for child health	− 0.17	0.037	21.10	0.000	− 0.06	0.84
"Having radio, TV, newspaper"	− 0.08	0.039	4.67	0.030	− 0.02	0.92
Age to begin breast-feeding	− 0.29	0.039	55.38	0.000	− 0.10	0.75
Age of child (month)	− 0.07	0.005	160.16	0.000	− 0.17	0.93
Constant	2.96	0.245	146.07	0.000		

Model Chi Square = 367, Significance = .000, Prediction = 76.8%

* Mother's education : using the secondary education category as a reference category

Table 6: Multiple Regression Analysis for Predicting Mother's Adherence To Beneficial Surrounding Diarrhea

Variable	B (unstand.)[1]	S.E. (stand.)[2]	B	T	sign.	Adj. R^2
Mother-in-law as a consult for child's health	0.09	0.02	0.05	3.8	0.002	0.268
Doctor as a consultant for child's health	0.05	0.02	0.03	2.2	0.030	
Have ORS at home	1.04	0.03	0.49	41.9	0.000	
Having radio, TV, newspaper	0.06	0.01	0.07	5.4	0.000	
Perceived diarrhea as a major childhood Disease	0.09	0.02	0.05	3.9	0.001	
Constant	2.15	0.03		77.9	0.000	

[1] unstand. = unstandardized regression coefficient [2] stand. = standardized regression coefficient

than those who do not read the newspaper.

A multiple linear regression stepwise method was used to determine the effects of several independent variables on the number of positive practices mothers use for treatment of diarrhea (such as continue providing solid food, liquids, ORS, etc). Independent variables regressed in this analysis consisted of whether ORS was at home, having a radio, TV or read newspaper, perceived diarrhea as a major childhood disease, mother-in-law used as a consultant for child health, and doctor was used as a consultant for child's health. Table 6 identifies the unstandardized and standardized regression coefficients with respective levels of significance. Overall, the model explained 26.8% of the variability in number of positive treatment practices. The strongest predictor was whether or not ORS was available at home.

Discussion

The results of this survey indicate that the CDD program and media and other influences has been successful in increasing knowledge regarding ORS. However, actual use of ORS continues to lag far behind knowledge while 91% of mothers have heard of ORS, only 34.7% adminisd it during their child's last episode of diarrhea. This gap between knowledge and practice suggests that ORS education programs are effectively reaching the target population, but that the messages are failing to change behavior. Clearly, there is a need to change the direction of the program and focus on encouraging mothers to translate their knowledge into action.

By linking diffusion of innovation and interpersonal change theories together, it becomes clear that public health education programs must address the specific needs of both individuals and communities to be effective. One implication of this is that health educators must determine where individuals and communities lie along the behavior change continuum before designing interventions; otherwise, program may not be matched to the needs of the target audience. Thus, health education programs must have two objectives: (1) to provide behavior change programs sequentially to match the individual's stage of change, and (2) ensure that individuals in the target population are moving through the stages of behavioral change (i.e., that the behavior is diffusing through the population).

The results of this study provide evidence that the population is moving along a continuum of behavior change 91% are aware of ORS. This is the precontemplation/awareness stage in the two

theories of behavior change described above. A total of 56% believe it is the best way to prevent diarrheal dehydration (contemplation/persuasion), 34.7% used it during the last episode (action), and 27% keep ORS is the home (maintenance). Some individuals and communities have moved along the continuum quickly; others, for one reason or another, are detained at one stage and must be convinced to move to the next stage. The stages of change provide points of intervention for future health education efforts; for example, it would be beneficial to determine what prevented 20% of mothers who believe ORS is the best treatment from actually practicing it, and to concentrate on removing those barriers.

The knowledge-practice gap suggests that current messages and channels have been successful in raising awareness of ORS, but unable to persuade mothers to use it. Knowing that the target population is aware of the product suggests that ORS promotion messages should begin to focus less on providing information and more on persuasive communication. At this middle stage of behavior change, mothers need advanced education regarding ORS; for example, they must be convinced that ORS is more effective than other methods to treat their child's diarrhea, and they must be taught to mix and administer it properly. Research by Prochaska demonstrates that an individual's evaluation of the pros and cons of a specific behavior were linked to their decision to perform that behavior, and subsequent maintenance of the behavior (Prochaska, 1994). In the case of ORS, this means identifying perceived advantages and barriers to using ORS.

According to the Diffusion of Innovation Model, those individuals in Pakistan most likely to adopt ORS have already done so; the next challenge is to reach the remaining individuals. More research is needed to determine the exact characteristics which separate the early adopters from the late adopters in each community. The need for more research in this area is underscored by a study in Haiti which found that the most important predictors of ORT knowledge and practice were the attributes of the individuals studied (Coreil *et al.*, 1988) . More information about the target population will help health professionals identify the resources in the community which are more closely matched to the individual and community stage of change.

The Diffusion of Innovation Model demonstrates that the acquisition of new information does not necessarily correspond to subsequent behavior change. In Pakistan, 91% of mothers have reached the first stage of change, awareness of ORS, but only

34.7% have reached the fifth stage and adopted ORS use. This underscores the need to better understand what motivates individuals to move through the stages of change. Some of the differentiation can be explained by predisposing characteristics some individuals are simply more ready to change than others or are more likely to defy social norms. These characteristics are associated with other socio-demographic characteristics. For example, it is generally believed that early adopters tend to be more educated, wealthier, and more urban-dwelling than late adopters a belief that is further supported by the results of this survey.

Due to these predisposing characteristics, early adopters have more access to the mass media, and they tend to rely on it as a source of health information. As a result, early adopters are more easily influenced by the mass media. Late adopters less educated, poor, and rural-dwelling individuals pose a challenge to health educators because they cannot be as easily reached or influenced by mass media channels. Late adopters rely more on interpersonal communication channels for information, and may be distrustful of other sources. This suggests that some Pakistani women may have heard about ORS through communication channels that are not likely to influence them. Health education campaigns, especially in the later stages, need to consider which communication channels will be most effective at persuading this audience.

Social influence is another important determinant of behavior. As the diffusion curve begins its ascent, precedent and support for the new behavior is developing simultaneously. Early adopters of the behavior can be used to influence late adopters both by serving as an interpersonal communication channel and providing an example.

Cultural belief systems may have a significant impact on the adoption or rejection of ORT within a community, yet many ORT promotion campaigns have been implemented with little understanding of the local cultures and dominant belief systems into which they are introduced. (Mull and Mull, 1988; Weiss, 1988). Mull found that remarkably little is known about how Pakistani women perceive ORT, resulting in culturally inappropriate messages (Mull and Mull, 1988). An improved understanding the issues and beliefs surrounding child health care will drastically improve the chances that messages will be received by the population.

A carefully selected communication channel can increase the salience and appeal of health education message. In Pakistan, where the mass media has already reached the early adopters, ORS promotion campaigns should use the existing social networks to channel information. For example, a poor or rural mother may be more receptive to receiving health information from other mothers, especially ones she knows. For this reason, a mother-to-mother dialogue should be actively encouraged. Where the existing social networks are inadequate, health outreach workers should be trained and dispersed to provide health education in the community and to build support for ORS.

The survey results indicate that many mothers continue to treat diarrhea with antibiotics and/or other drugs. In most cases, this is entirely unnecessary and potentially dangerous. Mothers must be convinced that ORS is the most effective way to prevent diarrheal dehydration. Promotion campaigns should also stress the added advantages of ORS, i.e. inexpensive, widely available, and does not require a visit to a doctor.

Research by Coreil and Genece in Haiti documented the pivotal role of medical institutions can play in dissemination of information about ORT (Coreil, 1988). However, current prescription practices in Pakistan are not supportive of ORS use. Health professionals sometimes view ORS as an adjunct approach to prevent diarrheal dehydration, to be used as a supplement to antibiotic therapy. Health professionals also need to be better educated about ORS and encouraged to prescribe it in place of antibiotics when appropriate. When health providers continue to recommend antibiotics to their patients, even in conjunction with ORS, it is reinforces the belief in the community that ORS is not an effective way to prevent diarrheal dehydration. Furthermore, when consulted about childhood diarrhea, health professionals should take advantage of this teachable moment to educate the mother about ORS instead of prescribing only antibiotics. Broader policy issues regarding the availability of drugs in Pakistan must also be addressed.

Conclusion: ORT is not the final solution for childhood diarrhea. Since diarrheal diseases are caused in part by social and environmental conditions that facilitate their transmission, the most significant improvements in child health will come as a result of improved sanitary conditions, personal hygiene, and living conditions. To be optimally successful, ORT promotion must be incorporated into an overall program of social and economic development. The combination of these two approaches, including targeted interpersonal modeling will be an important stimulus to move the remaining 65 percent of the population into the trial and adoption stages of behavioral change.

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