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Ethnomedical and Socioeconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawar(ite) Children

--Manuscript Draft--

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Full Title:	Ethnomedical and Socioeconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawar(ite) Children
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Corresponding Author:	Saira Husain Zaidi, MPH Berkeley Berkeley, CA UNITED STATES
Keywords:	Peshawar, Pakistan; gastroenteritis; ethnomedical knowledge; teething; diapers
Abstract:	This article considers ethnomedical knowledge and practices among parents related to contraction of acute gastroenteritis among children in Peshawar, Pakistan. Research methods included analysis of the Emergency Pediatric Services' admission register, a structured interview administered to 47 parents of patients seen in the Khyber Medical College Teaching Hospital, semi-structured interviews of 12 staff, and four home visits among families with children treated at the hospital. The use of native research assistants and participant observation contributed to the reliability of the findings, though the ethnographic sample is small. Our research indicated that infection rates are exacerbated in homes through two culturally salient practices and one socioeconomic condition. Various misconceptions propagate the recurrence or perseverance of acute gastroenteritis including assumptions about teething, rehydration solutions, and diaper usage. Additional information about structures of authority and gender hierarchy as they impact the illness experience are also reviewed. These ethnographic data offer a relatively brief but targeted course of action to improve the effectiveness of prevention and treatment efforts.
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Opposed Reviewers:	
Response to Reviewers:	August 20, 2014 Dear Reviewers, Thank you for the opportunity to revise and resubmit the attached manuscript, “Ethnomedical and Socieconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawarite Children”. We are delighted that the Reviewers found such merit in our findings, and we are pleased to have reorganized and clarified the manuscript as they suggested. We respond to each of their comments/queries below. As you will see, we have embraced nearly all suggestions, and made corresponding revisions in the attached version.

Reviewer #1
•There are some important omissions that were not part of the draft and I did not find submitted separately on the journal website. I could not find Tables 1, 5 or 6 which I assume contain the quantitative findings. There is an appendix 1, which has two pie charts, but this is not referred to in the text (and adds little so consider omitting)- Appendix 1 omitted. Appendix 2 is the gastroenteritis questionnaire but is referred to as Table 2. This has been corrected.
•Tables 3 and 4 are instruments, also not provided, but I don't recommend that they are included. Table 3 and 4 have been omitted.
•The paper needs re-organization. I have made some suggestions among the specific comments. The paper, and specifically the results, discussion, and conclusion have been significantly re-organized, and we are grateful for these helpful suggestions. Detailed replies are below.

Specific comments:
•Abstract, line 7; use of native research assistants seems essential rather than novel and description of this in the methods should be adequate. We agree, and have made this conversation more substantial and detailed in the Methods section.
•Abstract, line 8; are the ethnographic samples the home visits? This needs some further clarity. Yes, in part, and these changes are reflected in the Abstract and in the Methods section.
•Abstract, line 10; it is not clear how the misconceptions described impact on gastroenteritis. Does the poor knowledge of disease etiology result in delay in obtaining treatment? more severe disease? it would be great to have some more specific information provided here. What about the ORS has a negative impact?
This has been addressed in the abstract. We added information to the Ethnographic Results section that the belief that teething causes diarrhea prevents mothers from not actively preventing their c children from putting contaminated foreign objects in their mouth. Additionally, it was clarified that unclean water and improper ORT packet and water ratio may delay recovery. Lastly, we summarized this information in the conclusion.
•Abstract, line 14; It states that findings are reviewed. I prefer an abstract that states findings and draws conclusions on how the findings impact prevention, treatment etc and discourage the use of this type of language in the abstract. We have strengthened our conclusions in this regard, including placement of our own findings among other, similar published qualitative studies.
•Citations in the text are not consistent. They are in two forms (numbers in parenthesis and name plus year). Please comply with the journal requirements.
Thank you, we have made the necessary changes.

Background:
•Transmission rates can be high but should not be referred to as severe. We have taken this somewhat inflammatory language out in the revised version.
•Low-income country is a preferable term to 'underdeveloped'. Thank you. We accept this suggestion and use it throughout.
•This paper presents data that can impact on prevention and treatment. I would omit information on immunological immaturity as this is not relevant to the topics explored. The passage on "immunological immaturity" is a statement summarizing the findings of another study among children – one by Nagamani et al. (2007). We therefore would prefer to keep this material intact.
•Background first paragraph; It would be useful to include how anthropological research and quantitative methods can be complementary. We have expanded the comment here (in the Background section) but now return to it more substantially in our revised Conclusion. We feel this strengthens the broader applicability of our research.
•Background para 4; The objective of the study needs to be clearly framed. I think what is important to hospitals and policy makers are developing strategies to encourage prevention and home treatment steps, appropriate health seeking, and compliance with treatment. To this end cultural and contextual information is needed to aid strategy development for this setting, otherwise there are many studies that have explored prevention, treatment and compliance. Paragraph 4 has been substantially revised, and we have expanded our conclusion to return to these points of concern as well.

Research setting:

	•Clearly state why selecting this site in Peshawar was that relevant to the objective of the study? This is now done more clearly in the Research Setting. Methods: •2nd paragraph; The figures on patients with gastroenteritis are relevant for their selection in this study. However, this paper is not an epidemiological assessment of disease burden or etiology so I would stick to the information that is relevant to respondent selection. Was seasonality part of the consideration? Did you aim to select across seasons. It does not seem relevant in the methods section to propose underlying reasons for seasonality as there is a large body of literature on this. We have deleted all references to the seasonality material. •Table 2; The detailed questionnaire is not required for the paper. At most you could consider describing the objective and the topics covered. Details on the difficulties in administering the questionnaire may be relevant for the discussion but do not constitute results. If these data were specifically collected as part of the study, it would be useful to describe the study note taking or similar in the methods. The level of detail included here seems unnecessary, similarly for other questionnaires included in the paper. They can be omitted. We have removed Table 2, Table 4 and Appendix 2, and added only brief comments about our note-taking procedure. •There are a lot of results in the methods such as hospital admission figures. Ensure that the methods section just describes methods and not findings. We have moved the tabular and quantitative data into the Results section. Results: •There is a lot of text in this section that would be part of the discussion, for example, references to similar or contrasting studies. A better way to organize the paper would be to have the results and discussion together and then a conclusion section where the key discussion points are synthesized. This is reasonably common for qualitative studies. It is true that for qualitative research, a substantial amount of text – including quotes, explanation of terms/concepts, and contextual detail – are necessary. For this reason, our Ethnographic Findings section does conform to standard practice for qualitative research. However, in an attempt to address this Reviewer's concern, we have made some cuts to the narrative of our Findings, and moved some of the discussion to the conclusion section. •The results should start with description of the study population. We have added a description to beginning of Results section. •Teething seemed to be an a priori topic for exploration since it was in the quantitative questionnaire. This is not mentioned in the methods or the objective. Did it come from qualitative work? Did the ethnography inform the questionnaire design? No, this theme emerged through grounded analysis and coding of the interview notes, which is why it was not mentioned in the Methods or Objectives. We have repeated the source of these themes in the Methods section and in the Results section, to avoid reader confusion. •I would omit figure 2 as it doesn't add to or complement the findings. The objective is to identify perceptions of diarrhea to aid message development for treatment, care seeking. We have omitted figure 2. •Pseudonyms; I am not familiar with this style. Alternatively 'female infectious disease physician aged 32 years' or similar may be preferable to providing names, pseudonyms or otherwise. Although pseudonyms are commonly used in ethnographic literature, we agree that their use in this manuscript became cumbersome and uneven. We have therefore used descriptive markers, instead, as suggested. •Sherbet is the local term and has an entirely different meaning in high income countries; it makes sense to describe what this refers to at the first point that it is mentioned. Use italics for local terms. The requested changes have been made in the Rehydration Solutions section. •Generally rehydration solutions do not resolve the symptoms but their primary function is to prevent dehydration. They are perceived as medicines, whereas zinc has been shown to shorten diarrhea duration. Make sure that this misconception is clearer in the text. We have made these clarifying changes in paragraph 1 of Rehydration Solutions. •Ensure that ORS or ORT is chosen and used consistently. Done •Figure 3; the ORS packet; I am not sure what this adds and would suggest omitting it from the manuscript. The function of this picture is to offer a visual representation of how very little is being done to address the issue of illiteracy.

Discussion:
•If the decision is to keep the discussion separate, rather than incorporate with the findings, then the traditional style of having the discussion should flow from the results rather than introduce new themes should be followed. I did not see the themes of gender and hospital hierarchy emerge in the results. I would include that information in the results and discuss how to mitigate the negative impact. We have re-organized the manuscript to have a single Ethnographic Findings section, and a Conclusion which incorporates relevant literature and additional contextual information from the study that pertain to our recommendations. The material on gender and hospital hierarchy have, therefore, been folded into our concluding comments about HOW results can be applied to achieve better care. We feel this revised emphasis is a clear improvement, as requested.
•What needs to be highlighted is what this paper adds to previous studies. Moreover, the site was chosen to highlight the impact of the unique context, therefore contrast findings with other studies. The discussion can provide a summary of how things may need to be handled differently within the context. According to my earlier suggestion, I would consider including this in the conclusion instead. We have prepared a new Conclusion in response to this request.

Conclusions;
•Much of this section belongs in the Discussion. Including a summary of the way forward/next steps would be ideal for the Conclusion. Proposing additional research with a specific direction or theme is better left for the end of the conclusion. Some of the public health messages that are appropriate have been suggested previously; treat diarrhea with ORS and seek treatment if symptoms persist. Thus tailoring suggestions to the context of this study, and how this can be applicable to other countries encountering similar conflict should be considered. Our new Conclusion better meets these expectations.

Reviewer #2:
•An important piece of information and a good effort to summarize findings.
Some formatting and editing may be needed. A brief of comments, kindly follow the pdf for detailed insight. Kindly review tables and figures lables and numbering. We have addressed each of the items in the PDF file, including revisions to the tables and figures.

Methods:
•Kindly mention the inclusion and exclusion criteria.- Inclusion criteria was added to the methods section based on how patients were initially screened to participate in the study.
•The reader may want to know the analysis performed and how data collation took place. A brief summary of the grounded analysis and coding techniques used, standard methodologies for ethnographic data, is now included in the Methods section.
•As mentioned, your interpreter for local language are an important strength in the study, kindly share their recruitment and background. Is there any potential bias in translation or interpreting information? In any case, kindly mention it for your readers. A response to this inquiry was written in the paragraph of Methods section.
•Some of the sections in methodology, after briefly introducing here may be detailed in later sections (a few of results and discussion is found in methods). We have moved the quantitative information to the results section.

Data:
•Is there any table that has summary of responses/results, the authors may consider including any such data. I added such a table to the teething section, however, I do not believe it is necessary since most sections have the data either written out or already in table format.

Results and conclusion:
•The local language terms, kindly elaborate them as the journal has readers from international community. The local terms are now italicized and a bit more explanation is offered.
•This is a good effort and informative work, the conclusion may have specific doable recommendations accordingly. Since the author know the study settings best of all, they may consider local context (hospitals and homes) while recommending

	interventions. We have addressed this in the new Conclusion. •The authors described that the areas is full of refugees, were any participants some of the refugees. In any case, how do they compare refugees' situation with the local population. Is there any chance that they may have any influence on each others? We address the presence of a high number of refugees in our Methods section, but because sampling was not conducted for a representative balance of refugee and non-refugee, we cannot speak to this population. Instead, we limit our conclusions to characteristics of crowded housing, low education, and local beliefs about teething. •The attached questions has numerous questions, the responses from all of them (not included in this paper) may not be significant. In any case kindly mention very briefly, since they are part of the questionnaire. This suggestion contradicts one made by another Reviewer. For clarity's sake, we have chosen not to include all questionnaire items in this publication, with gratitude to both reviewers for their suggestions on this topic. We have enclosed both a clean "Manuscript" file and the "Manuscript with Track Changes" along with this letter. Thank you again for your consideration and we look forward to your response. Sincerely, Saira H. Zaidi* and Carolyn Smith-Morris * corresponding author 210 Broadway St. Apt #3 Millbrae, CA 94030 saira.zaidi@berkeley.edu 682.225.9759
Additional Information:	
Question	**Response**
Financial Disclosure Please describe all sources of funding that have supported your work. A complete funding statement should do the following: Include **grant numbers and the URLs** of any funder's website. Use the full name, not acronyms, of funding institutions, and use initials to identify authors who received the funding. **Describe the role** of any sponsors or funders in the study design, data collection and analysis, decision to publish, or preparation of the manuscript. If they had no role in any of the above, include this sentence at the end of your statement: "*The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript*." If the study was **unfunded**, provide a statement that clearly indicates this, for example: "*The author(s) received no specific funding for this work*."	This research project was funded by the Richter Research Fellowship Program by Southern Methodist University received by SHZ. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. http://smu.edu/univhonors/Richter%20International%20Fellowships.asp

* typeset	
Competing Interests You are responsible for recognizing and disclosing on behalf of all authors any competing interest that could be perceived to bias their work, acknowledging all financial support and any other relevant financial or non-financial competing interests. Do any authors of this manuscript have competing interests (as described in the PLOS Policy on Declaration and Evaluation of Competing Interests)? **If yes**, please provide details about any and all competing interests in the box below. Your response should begin with this statement: *I have read the journal's policy and the authors of this manuscript have the following competing interests:* **If no** authors have any competing interests to declare, please enter this statement in the box: "*The authors have declared that no competing interests exist.*" * typeset	The authors have declared that no competing interests exist.
Ethics Statement You must provide an ethics statement if your study involved human participants, specimens or tissue samples, or vertebrate animals, embryos or tissues. All information entered here should **also be included in the Methods section** of your manuscript. Please write "N/A" if your study does not require an ethics statement. **Human Subject Research (involved human participants and/or tissue)** All research involving human participants must have been approved by the authors' Institutional Review Board (IRB) or an equivalent committee, and all clinical	This study was approved by the Institutional Review Board of Southern Methodist University and written informed consent was obtained from all subjects.

investigation must have been conducted according to the principles expressed in the Declaration of Helsinki. Informed consent, written or oral, should also have been obtained from the participants. If no consent was given, the reason must be explained (e.g. the data were analyzed anonymously) and reported. The form of consent (written/oral), or reason for lack of consent, should be indicated in the Methods section of your manuscript. Please enter the name of the IRB or Ethics Committee that approved this study in the space below. Include the approval number and/or a statement indicating approval of this research. **Animal Research (involved vertebrate animals, embryos or tissues)** All animal work must have been conducted according to relevant national and international guidelines. If your study involved non-human primates, you must provide details regarding animal welfare and steps taken to ameliorate suffering; this is in accordance with the recommendations of the Weatherall report, "The use of non-human primates in research." The relevant guidelines followed and the committee that approved the study should be identified in the ethics statement. If anesthesia, euthanasia or any kind of animal sacrifice is part of the study, please include briefly in your statement which substances and/or methods were applied. Please enter the name of your Institutional Animal Care and Use Committee (IACUC) or other relevant ethics board, and indicate whether they approved this research or granted a formal waiver of ethical approval. Also include an approval number if one was obtained. **Field Permit** Please indicate the name of the institution or the relevant body that granted permission.	

Data Availability PLOS journals require authors to make all data underlying the findings described in their manuscript fully available, without restriction and from the time of publication, with only rare exceptions to address legal and ethical concerns (see the PLOS Data Policy and FAQ for further details). When submitting a manuscript, authors must provide a Data Availability Statement that describes where the data underlying their manuscript can be found. Your answers to the following constitute your statement about data availability and will be included with the article in the event of publication. **Please note that simply stating 'data available on request from the author' is not acceptable.** ***If, however, your data are only available upon request from the author(s), you must answer "No" to the first question below, and explain your exceptional situation in the text box provided.*** Do the authors confirm that all data underlying the findings described in their manuscript are fully available without restriction?	Yes - all data are fully available without restriction
Please describe where your data may be found, writing in full sentences. **Your answers should be entered into the box below and will be published in the form you provide them, if your manuscript is accepted.** If you are copying our sample text below, please ensure you replace any instances of XXX with the appropriate details. If your data are all contained within the paper and/or Supporting Information files, please state this in your answer below. For example, "All relevant data are within the paper and its Supporting Information files." If your data are held or will be held in a public repository, include URLs, accession numbers or DOIs. For example, "All XXX files are available from the XXX database (accession number(s) XXX, XXX)." If this information will only be available after acceptance, please indicate this by ticking the box below. If neither of these applies but you are able to provide details of access elsewhere, with or without limitations, please do so in the box below. For example: "Data are available from the XXX	All files are available from the figshare database. URL: http://figshare.com/articles/Ethnomedical_and_Socioeconomic_Factors_in_the_Prevalence_of_Acute_Gastroenteritis_in_Peshawar_ite_Children/1015622

Institutional Data Access / Ethics Committee for researchers who meet the criteria for access to confidential data." "Data are from the XXX study whose authors may be contacted at XXX." * typeset	
Additional data availability information:	

210 Broadway St. #3
Millbrae, CA 94030

May 23, 2014

PLoS ONE
1160 Battery Street
Koshland Building East, Suite 100
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To Whom It May Concern:

I am writing to submit our manuscript entitled, “Ethnomedical and Socioeconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawar(ite) Children,” for consideration for publication in PLoS ONE.

Acute gastroenteritis is the second leading cause of death in children under the age of five in developing countries; however, its prevalence and culturally relevant, driving causal factors are unknown in Peshawar. In an effort to determine the prevalence of diarrhea in Peshawar and to improve the situation, an ethnographic and epidemiological study was conducted to find out beliefs and traditional health practices.

Through our research, we determined that 58% of summer admits and 24% of winter admits to Khyber Teaching Hospital in Peshawar were diagnosed with acute gastroenteritis. Additionally, we found that various misconceptions lead to the propagation and recurrence of acute gastroenteritis. These included misconceptions about teething, diaper usage, methods of rehydration, and gender and hospital hierarchies.

An understanding of local beliefs surrounding health is fundamental to the development of appropriate diarrheal interventions. Because our findings could be applied to other similar regions of the developing world, they are likely to be of great interest to the vision scientists, researchers, clinicians, and trainees who read your journal.

This research was presented at the Clinton Global Initiative. The manuscript describes original work and is not under consideration by any other journal. All authors approved the manuscript and this submission.

Thank you for receiving our manuscript and considering it for review. We appreciate your time and look forward to your response.

Kind Regards,

Saira H. Zaidi, MPH

TITLE: Ethnomedical and Socioeconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawarite Children

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ABSTRACT:
This article considers ethnomedical knowledge and practices among parents related to contraction of acute gastroenteritis among children in Peshawar, Pakistan. Research methods included analysis of the Emergency Pediatric Services' admission register, a structured interview administered to 47 parents of patients seen in the Khyber Medical College Teaching Hospital, semi-structured interviews of 12 staff, and four home visits among families with children treated at the hospital. The use of native research assistants and participant observation contributed to the reliability of the findings, though the ethnographic, home-visit sample is small. Our research indicated that infection rates are exacerbated in homes through two culturally salient practices and one socioeconomic condition. Various misconceptions propagate the recurrence or perserverance of acute gastroenteritis including assumptions about teething leading to poor knowledge of disease etiology, rehydration solutions leading to increased severity of disease, and diaper usage leading to the spread of disease. In our Discussion, we suggest how hospital structures of authority and gender hierarchy may impact hospital interactions, the flow of information, and its respective importance to the patient's parents leading to possible propagation of disease. These ethnographic data offer a relatively brief but targeted course of action to improve the effectiveness of prevention and treatment efforts. [Peshawar, Pakistan; Gastroenteritis; Ethnomedical Knowledge; Teething; Diapers]

Introduction

Acute diarrheal disease in children is a major concern in both the developing world and politically violent contexts. The social and economic circumstances that normally create food and water insecurity are exacerbated in these areas by weakened medical infrastructures and limited resources, producing epidemic levels of disease in the already vulnerable population of children under the age of 5. Even where biomedical intervention and education is present, transmission rates can remain high because of diverse cultural and socioeconomic factors, as was recently discussed by Nurul Huda [1]. The difficulty of reducing diarrheal infection through biomedical interventions alone highlights the need to complement medical education and oral rehydration therapies with culturally-informed strategies and community awareness. As Vecchiato, Zwane and Kremer demonstrated for tuberculosis control and diarrheal disease (respectively),

anthropological research is useful for identifying the cultural correlates of disease, particularly those which determine patient utilization of available, proven prevention techniques [2,3].

We therefore conducted a brief ethnographic study to better understand the context of acute pediatric gastroenteritis in Peshawar, Pakistan, which is a major educational, political and business center of Khyber Pakhtunkhwa. It is a culturally diverse city near the border of Pakistan and Afghanistan—currently a dangerous site of terrorist violence and heavy refugee flows. This research illustrates the utility of ethnographic methods for understanding, even in short research periods, the impact of complex patient lifeworlds on willingness to follow biomedical advice.

Figure 1. Map of Pakistan
source: http://pakistanhindupost.blogspot.com/2010/06/hindu-community-in-nwfp-or-khyber.html

Background

Gastroenteritis, the inflammation of the gastrointestinal tract, is a well-known illness that plagues over 111 million children under the age of five worldwide annually of which 1.3 million die annually [4,5]. It often leads to dehydration and death. In low-income countries, acute gastroenteritis is the second leading cause of death among infants and children under the age of 5 [6]. Regional differences of global deaths due to diarrhea are large with proportionate mortality in Southeast Asia account for 31.3% of deaths [7]. Exposure to these viral and bacterial infectious organisms occurs primarily through consumption of contaminated food and drink. Fecal to oral transmission is facilitated by unsanitary conditions. Prevention of transmission involves improvement of sanitary conditions, health education, and nutrition [8]. As such, anthropological research and quantitative methods are complementary in assessing the extent and reason behind diseases propagation, and in identifying effective strategies in socially complex and pluralistic health care settings [9,10,11]

Although the causal mechanisms of acute gastroenteritis have been well established, the contextual reasons for their occurrence in any given place vary. Factors

include economics and poverty level, sanitation infrastructure, cultural and historical factors related to sanitation, and the behaviors and beliefs of patients [12]. Deprivation manifested by household crowding and low maternal education has also been identified as correlated to increased transmission [13]. Identified behavioral factors affecting transmission include sub-optimal breastfeeding duration or practices [14], storing food at room temperature rather than refrigerating, failure to wash hands, failure to dispose of feces hygienically, and drinking contaminated water [15].

In the research conducted by Mumtaz, Ahmed and Ali, the factors mentioned above apply to the Afghan refugee population, which lives in poor hygienic conditions and among large families. They report that children are "not properly looked after and hand washing is not practiced" [16]. Similar observations were made in the study conducted by Nagamani in Indonesia and Ghana [17]. They remind us that the increased infection rate in children under five might also have been due to the immunologic immaturity of this age group, particularly those under the age of two, through early weaning and contaminated food and water.

Hospitals and policy makers are developing strategies to encourage prevention, home treatments, appropriate health seeking, and treatment compliance. To this end, cultural and contextual information is needed to aid strategy development for this setting. This research is increasingly important to hospitals and other policy makers in Peshawar, which have been devastated by war, terrorist attack, and refugee influx since the Soviet War in Afghanistan in the 1980s. Such research must be responsive to local beliefs and events, including the constantly changing conditions of war as well as the multi-cultural aspects of refugee zones [18,19]. As such, we conducted a brief but multi-faceted ethnographic study to better understand the cultural and contextual factors that might influence transmission and treatment adherence for acute gastroenteritis among Peshawar children.

Research Setting

Peshawar has not been formally studied for risk factors and prevalence of acute gastroenteritis. Crude estimates from the Hayatabad Medical Complex, a teaching hospital in Peshawar, indicate that acute gastroenteritis accounts for 25% of all admissions to the pediatric unit of the hospital in 2004 [20]. Our objective was to supplement these data with up-to-date contextual information and speak to factors leading to the prevalence of acute gastroenteritis.

Located twenty miles from the Afghan border, Peshawar, Pakistan is filled with refugees that fled to Pakistan during the Soviet War of the 1980's and the current war in Afghanistan **(Figure 1)**. The devastating floods of 2010 in Pakistan also displaced a large population of people that are now living in Peshawar. Peshawar is the provincial capital of the Khyber Pakhtunkhwa province of Pakistan. Its neighborhoods range from refugee encampments to urban dwellings. This unique and diverse population is of low socioeconomic status and comprises a significantly underserved area. There are biomedical, local, and government based health care resources, although biomedicine is broadly regarded as the most effective. This combination of factors made Peshawar an excellent site for understanding cultural and contextual factors in treatment and control of child gastroenteritis.

Methods

Ethnographic research was conducted in Khyber Medical College Teaching Hospital, which serves as a central treatment facility for the Peshawar region. The Emergency Pediatric Services (EPS) and the Out-Patient Department (OPD) where all gastroenteritis patients are seen became the clinical home of the project. In Khyber Teaching Hospital, the OPD primarily focuses on chronic gastroenteritis patients: those with diarrhea for greater than 14 days. Patients who suffer from diarrhea for less than 14 days are diagnosed with acute gastroenteritis and are cared for in the EPS. These two wards offered important contrasting perspectives on the chronic versus acute forms of gastroenteritis, and resulting hospital admissions, in the region. Analysis of the EPS admission registry from June and December 2011 focused on the key words 'diarrhea' and 'acute gastroenteritis' (or 'AGE'). All patients who had diarrhea or 'AGE' written under diagnosis was counted as an acute gastroenteritis patient.

All patients under the age of five who came to the EPS with primary complaint of diarrhea between 10am and 3pm during the thirty-day study period were invited to participate in the study. Only those patients whose children were over the age of five and did not have a primary complaint of diarrhea were excluded. Recruitment yielded a sample of 47 patients under the age of five whose accompanying parents completed a comprehensive, semi-structured interview and 52-item questionnaire.

Local research assistants were employed for ease of communication, including one local nurse who was recruited based on her Pashto language knowledge and trained on how to translate and interpret patient information. The nurses' biases may include the summarization of patient communication and interpretation of disease descriptions. After consent procedures, all interviews were conducted in either Urdu or Pashto based on the patient's preference and recorded using a handheld recorder so that parents could be invited to elaborate on their responses. Interviews were conducted in the EPS unit, OPD unit, or patient's home and ranged from 15 to 45 minutes in length. Parents were given an antibacterial soap as a gift for their time. These gifts were considered an incentive to participate in the research and had the added benefit of emphasizing the importance of sanitation.

The questionnaire addressed patient demographics, ethnic and religious background, household characteristics, primary caregiver information, an overview of water and food resources, and an assessment of the parent's knowledge of the disease**.** The objective of the questionnaire was three-pronged: to assess the patient's background, possible underlying causes of disease propagation, and prior disease knowledge.

Questionnaire responses along with general observations were documented and later grouped into pertinent topics including sanitation, water usage, counseling, disease, expectations, hierarchy, socioeconomic causes, and cultural values. Interview responses were analyzed through grounded analysis and discussion of thematic content to consensus between both authors. Items mentioned by at least 5 different informants were considered thematic. The themes reported below were raised by at least 9 different informants and were, therefore, considered salient.

The structured interviews with parents were complemented by semi-structured interviews with doctors, nurses and staff members regarding water sanitation, hygiene, and the political atmosphere. A total of twelve staff in four different professional positions were interviewed.

The specific circumstances and conditions in Peshawar at the time made this a challenging research site. The U.S. Department of State believes the situation to be sufficiently dangerous that it has discouraged American citizens from traveling to Pakistan. Ms. Zaidi was able to secure access due to her own status as a second generation Pakistani-American who is fluent in Urdu, has spent extensive time in Pakistan and is familiar with local customs and norms. Additionally, through previous work and personal connections, Ms. Zaidi had the support of a network of physicians and hospital administrators in Pakistan. Her knowledge of local customs and ability to quickly integrate based on her ethnic heritage were critical to secure access to patients, data and resources needed to make this project a success.

We took a number of additional steps to supplement Ms. Zaidi's own knowledge and experience. First and foremost, Ms. Zaidi maintained daily contact with a university police officer (from her host university and IRB institution) and hired a local driver / security guard to help her navigate the neighborhoods of Peshawar safely. The three Peshawar research assistants were compensated at rates appropriate for their location and skill. They were primarily used to help interview participants and record data in the form of photographs of participants and some of their local water sources. Neutral probes and prompts were used in interviews, consistent with ethnographic interviewing techniques, and longer narratives were encouraged given the ethnographic nature of the research. Ms. Zaidi conducted home visits and unstructured interviews at four patients' homes. There, patients and their female family members were questioned about their living environment, practices related to sanitation, water sources, and their explanatory models of acute gastroenteritis [21]. Ethnographic methods of immersing oneself in other cultures are important for the purpose of capturing full contextual detail from patients' lifestyles, and is particularly important for cross-cultural work in which patients come from a multitude of ethnicities and backgrounds (as in refugee zones). These methods also allow for additional, alternative perspectives on patients' lives for which simple, hospital-based questionnaires would be inadequate by themselves.

Finally, although our goal did not include a complete study of the refugee experience and context of violence, a note about these variables is necessary. During our research period alone, two bombs killed over 60 people, including a doctor from Khyber Medical College Teaching Hospital. Patient #40 lived in the neighborhood of Bara, where terrorists and extremists often gather. The patient's mother complained that normal people could not leave their home for days at a time and were stuck in one room: "the diarrhea is due to unsanitary conditions, but Taliban (a fundamentalist Muslim political movement in Afghanistan) and police are around my house, I can't leave". Thus, participant observation allowed us to assess sanitation levels from an etic perspective and to observe the daily practices that might affect patient compliance with biomedical instructions, and ultimately the prevalence of acute gastroenteritis.

Ethics Statement

This study was approved by the Institutional Review Board of Southern Methodist University and written informed consent was obtained from all subjects.

Ethnographic Results: Cultural Factors affecting Diarrheal Infections

From EPS records reviewed on site, approximately 200 patients are seen per day in the EPS, approximately 41% of whom came in with a primary complaint of acute gastroenteritis (**Table 1)**. Our sample of 47 patient families during a period of 30 days in the Winter of 2011 is non-representative, but offers insights into the beliefs, practices, and knowledge of this large patient group. Our ethnographic data point to three salient local practices in contraction of pediatric gastroenteritis. They are: (1) teething and its relationship to gastroenteritis, (2) the use of rehydration solutions, and (3) diaper usage.

Table 1. Emergency pediatric services admissions records for two select months of 2011.

	Gastroenteritis	Other	Total	Percent
Total	4,920	7,080	12,000	41%

(1) Teething

Teething was described the emergence of new baby teeth and often a subsequent chewing of objects to alleviate pain. In Peshawar, eleven out of 47 parents questioned (23%) cited a link between acute gastroenteritis and teething (**Table 2)**. 9% cited a link without prompting, and an additional 7 parents (15%) reported a link when asked directly. This belief led parents to engage in certain measures or lack of oversight that might exacerbate, rather than ameliorate gastroenteritis, a problem that has been documented in several developing contexts. These actions include, for example, not actively preventing their children from putting contaminated foreign objects in their mouth. In a study of maternal beliefs concerning diarrhea in North India, more than 50% of 600 mothers blamed their children's diarrhea on teething. Similar beliefs have been reported from other countries such as Nepal [22,23].

Table 2. Teething a cause of diarrhea

Response	Number of Participants	Percentage
Yes	11	23%
No	36	77%
Total	47	100%

Notably, hospital staff members were also likely to affirm a relationship between teething and contraction of gastroenteritis. The head of the Malnutrition Unit at Khyber Teaching Hospital, explained "kids put their dirty hands and dirt in their mouth especially when teething, which causes them to contract acute gastroenteritis." Conversely, a pediatric physician intern in the children's ward—attributed causality not to dirt, but to the stress a child undergoes when his/her teeth first being to emerge. She believed that acute gastroenteritis contracted in this manner is self-limiting and resolves on its own within two to three days. Additionally, a nurse in the EPS department also believed teething causes acute gastroenteritis. Misconceptions or oversimplification on the part of

parents of the causal pathways to AGE may be a result of interactions between physicians and parents. Physicians often asked parents if the child was teething, and immediately afterward wrote a prescription for medication to treat gastroenteritis without further investigation. The conflation of correlation and causation is not uncommon, and several nurses, doctors, and nutritionists, along with parents, cited teething as a cause of acute gastroenteritis.

We were particularly interested in how informants expressed the relationship between teething and acute gastroenteritis. Their explanations of the relationship spanned a wide range: no explanation; the stress or pain of teething ("the child is in a lot of pain"; and "[I] gave my other children oral drops that I put in their water to ease the teething pain so that they would not be in pain and have acute gastroenteritis"); the increased exposure to dirt or infectious agents associated with greater mobility at this age; or the increased exposure to dirt or infectious agents associated with putting hands and items in the mouth. Research from Macknin indicates that in actuality teething causes children pain, which leads to an increase in the number of foreign objects the child puts in his or her mouth [24]. While the mastication of these typically unhygienic objects often leads to acute gastroenteritis, the mere emergence of teeth in babies does not. Since even hospital staff can operate under these beliefs, it will be important that prevention efforts ascertain the explanatory models of parents and providers *as part of* prevention and intervention.

(2) Rehydration Solutions

Rehydration solutions are essential in preventing dehydration that is the primary cause of death associated with diarrhea.. Oral Rehydration Therapies, or ORT, can include cost effective medicine or dietary supplements that help manage acute gastroenteritis symptoms. Newer ORT's fortified with Zinc are quite effective and are widely used in the region to shorten the duration of diarrhea [25]. Improper water to ORT sachet ratio along with unclean water, however, can delay recovery. Additionally, certain local approaches to rehydration worsen acute gastroenteritis.

Questionnaire responses and personal narratives in our research illustrated that there was a surprisingly high rate of tea and *sherbet*, a local sugary drink, usage in children. Seven out of 47 parents (~15%) cited feeding their children either tea or *sherbet* to remedy dehydration from acute gastroenteritis. One mother complained to the nurse "my child won't drink any water when dehydrated" and so the nurse recommended adding lemon and sugar, or Tang, an orange flavored drink mix available in local stores, to make it tastier for the child.

Chai and *kava* are common hot beverages in Peshawar, Pakistan. *Kava* is a native green tea that is drunk throughout the day by all socioeconomic classes regardless of outdoor temperature. While teas are commonly recommended to patients sick with a cough and are used routinely around the world for medicinal purposes, they can actually be harmful in the case of acute gastroenteritis [26]. These local teas are infused with sugar that worsens the rate of dehydration [27]. A typical homemade oral rehydration solution consists of six teaspoons of sugar and ½ a teaspoon of salt in a liter of boiled water [28]. *Chai* and *kava* have anywhere from 1 teaspoon to 2 ½ teaspoons of sugar in .25 liters (one cup).

Excessive amounts of sugar can make diarrhea worse and prevent intake of important minerals necessary for the child, whom is often dehydrated [29]. The same can be said about lemon and sugar water, as well as Tang flavored water. Tea or *chai* contains excessive concentrations of aldehyde (a carbon double bonded to oxygen, a hydrogen and an R group) and low concentrations of sodium. The inappropriate glucose-to-sodium ratio impairs water absorption, and the large osmotic load creates an osmotic diarrhea, further worsening the degree of dehydration [30]. These sugared drinks, if not properly made, can actually worsen acute gastroenteritis symptoms. Furthermore, tea has caffeine (a diuretic), which can also possibly worsen acute gastroenteritis [31].

Communication of instructions for ORT use is an additional cause for concern. Many ORT medications are packets of medication, which must be prepared in a specific way; namely, mixed into a precise quantity of boiling water. The written instructions pose an issue for this population, as 75% of the respondents interviewed were illiterate (**Table 3**). These sachets are purchased over-the-counter as per the doctor's instruction and have explicit directions on how to prepare the ORT on the back **(Figure 2)**. The patient's family is told to purchase the ORT and is typically given a quick overview of the purpose of it and a times how to prepare it by the prescribing physician. Many women simply pour the packet into what they feel is a sufficient pot of water. Women who cannot read the instructions are limited to instructions that they receive orally. They are at a disadvantage because their compliance is dependent on their ability to remember these oral instructions. This likely also limits their access to any supplementary written explanation of the medication.

Table 3. Mother literacy levels.

Response	Number of Participants	Percentage
Yes	11	25%
Partially	1	2%
No	33	73%
No Response	2	-
Total	47	100%

Pakistani Oral Rehydration Salts

Figure 2. The boxed words on both pictures display the brand of the ORT, Davisalts, in English and Urdu. In the leftmost image, the text surrounding the '1' in the red circle states "For 1 litre of water" in English. The smaller writing on the packet in the leftmost picture is the first part of the instructions for making ORT.

The literacy issue was illustrated in the children's ward one day, when patient #24's mother was chastised by the doctor. She had yet again over-diluted her child's baby formula, and therefore her child was not receiving sufficient nutrients. Staff members reported that over-dilution is a common problem not only with bottle feeding, but with various medications as well. Yet literacy is not the only problem in this scenario; poor methods of communication and impatience with differences in explanatory models due to lack of resources exacerbate illness through under-effective treatment efforts. Parents may misunderstand biological processes and hold incorrect perceptions about medication or treatment. Additionally, clinicians may fail to give information in a way that can be understood and utilized by parents, given the context of their lives, their literacy, and their resources.

(3) Diaper Usage

Socioeconomic disparity was not assessed, but was manifest in parents' varied access to nutritional foods, in sanitation, and in the use of diapers versus cloth or no diapers (**Table 4**). Store-bought diapers sufficiently contain child's waste and minimize the risk of oro-fecal disease; however, they are expensive and cannot be reused like cloth diapers. Clothe diapers, while more economical, are unable to fully contain children's waste without a protective external lining, increasing the likelihood of exposure to fecal material. Foregoing diapers altogether is least expensive, but also least likely to contain children's waste.

Table 4. Diaper Types.

Diaper Type	Number of Participants	Percentage
Store-bought	9	45%
Cloth	8	40%
No diaper	3	15%
No Response	27	-
Total	47	100%

Acute gastroenteritis is spread via fecal-to-oral transmission as well as several alternative mechanisms [32]. In resource-poor settings, poor fecal containment and inadequate washing practices promote the quick spread and reinfection of children with acute gastroenteritis [33]. Household crowding increases the likelihood of exposure to unsanitary conditions and will be particularly problematic in households with young children [34]. Given the climate of violence in Peshawar today, crowded household conditions already common in the poorest areas are made worse by fear of gathered terrorists in the neighborhood.

To better understand parents' contingent strategies in this atmosphere of violence, the clinical questionnaire was modified during the field season. Twenty of the 47 (43%) patient's parents were asked to specify the type of diaper, if any, they used for their children. This sub-sample offers insight to not only socioeconomic factors in fecal to oral transmission, but also the household circumstances that impact spread and reinfection of acute gastroenteritis. Twelve out of the 20 or 60% of those patient's parents interviewed said they used cloth or no diapers for their children. Two of those that used store-bought diapers acknowledged that they "didn't have children for years and so now they are spoiled with store bought diapers". Cloth diapers and clothing alone (no diaper) allow leakage of fecal material onto secondary surfaces such as bed sheets, the floor, or the hands of people caring for the child. This is particularly an issue when multiple children and parents sleep on the same surface

Use of cloth, disposable, or no diapers was explained here as an economic issue and a cultural factor or explanatory model difference. We acknowledge that certain contextual and economic factors are beyond the ability of clinicians to ameliorate, and possibly even address, including warzone and terrorist violence in neighborhoods. In these circumstances, acknowledgement of and sensitivity to these conditions can be helpful. At Khyber Teaching Hospital, for example, food supplements are given to patients in the Malnutrition Unit. Although disposable diapers would have been helpful in reducing fecal to oral transmission, they did not appear to be a central element of prevention or treatment resources.

Discussion & Conclusion:

Acute gastroenteritis is prevalent among children in Peshawar, Pakistan and has several cultural and contextual factors that contribute to transmission rates. This research suggests that themes of teething, rehydration strategies, diaper usage, and hierarchy will be important for future prevention and treatment. Local views about teething and its connection to acute gastroenteritis affect the actions that parents take to avoid

transmission. Finally, lack of information about the proper and most effective use of rehydration solutions potentially worsens acute gastroenteritis symptoms, as does inadequate containment of children's waste.

How might these ethnographic lessons be productively applied through local health care structures and authorities? Anthropologists and other social scientists have shown the value of in-depth, local knowledge for effective health interventions, regardless of the location [35, 36, 37]. But sites of conflict, danger, extreme resource pressure like refugee camps are particularly vulnerable to the challenges of conflicts in healing modalities or beliefs, limited access to health care, and over-taxed health care infrastructures and staff [38, 39]. Many examples may be found; Halvorson's work on women's role in making or breaking the "chain of [diarrhea] contamination" within the household sphere is informative in this regard [40]. Sustained changes in behavior as well as the enhancement of women's capacity to solve health problems were found to be crucial to the objectives of rural water, sanitation and diarrheal disease control programs [41]. Caregivers frequently fail to recognize children's diarrhea, especially among younger infants and when illness signs are less severe [42]. Mothers' responses to diarrheal diseases are mitigated and shaped by community values, belief systems, gender dynamics, and the socioeconomic circumstances in which they live, work, and raise families [43]. Our research confirms that programs which take mother's beliefs and resources into account are more likely to be locally relevant and sustainable, if not also successful. Halvorson's gendered finding is a good example – although only one example – of the importance of ethnographic data to effective health care.

Peshawar is a patriarchal society in which the eldest male governs the household [39]. Women are the primary caretakers of children, and in the hospital only women were allowed inside the children's ward, which Ms. Zaidi observed and noted through participant observation and personal narratives. Additionally, there is a distinct hierarchy among the hospital personnel, which impacts interactions, the flow of information, and its respective importance to the patient's parents [44]. Women and their children primarily frequented the children's wards in the hospital. On occasion, men would enter EPS with their children, primarily when speaking to the physician, but whenever the child had to be sent in to the EPS for injections or IV rehydration, men (even fathers) were not allowed to enter the EPS. That children's hospital wards are the domain of women attests to the patriarchal nature of the Peshawarite gender roles. Women are universally the primary caregivers [45]. Men accompanied their women primarily for their protection and supervision, and not for their role in childcare. This local ethnographic and qualitative data, even acknowledging its small scale and sample, has provided inexpensive but crucial information about the social context of health care in Peshawar, including gender norms for home care, spending on medications, and hygiene.

But to ensure ethnographic findings are applied, the authoritative structures within health care systems must also be taken into account. There is usually a clear professional hierarchy in public hospitals such as Khyber Teaching Hospital. Doctors are at the top of this hierarchy, after which comes nurses and nutritionists followed by other personnel. This hierarchy is evident in the interactions between doctors and nurses, and in the interactions of both medical groups with patients. While there is often friendly banter and conversations between doctors and nurses, quite often one of the physicians would raise his voice at one of the nurses for not following his directions. A nurse in the EPS

department at the beginning of data collection told Zaidi, "the doctor is being nice and putting on a good show for you, but he scolds us and the parents often". Similarly, doctors and nurses berate their patients' parents. When asked why there appeared to be a lack of patience with parents, a nurse explained, "One, many parents want their child to be cured right away. They do not comprehend that the process will take a while and they do not want to wait. Two, parents feel like they need injections and that they have not been properly treated until they receive antibiotics or injections". These circumstances frustrate doctors and nurses who end up berating parents for their lack of understanding and knowledge. Yet despite the scolding and hierarchy, and regardless of how the patient and his or her parents felt about the doctor, they greatly valued the doctor's opinion and followed their advice when feasible and properly understood. These social and hierarchical variables impact not only how care and education are delivered, but the ways in which patients can receive information and collaborate in health management.

Peshawar was chosen as a study site to highlight the impact of its unique context. Our research contributes data on regionally pertinent cultural beliefs and patterns of behavior relevant to the propagation of acute gastroenteritis. However, we also contribute to the growing body of literature that calls for collaboration between quantitative and clinical strategies, on the one hand, and qualitative studies of context, on the other. The widespread presence of teething explanations for diarrhea particularly held by practitioners who have significant authority in the community, indicates that these beliefs will not be easily dismissed. Preventive measures must be taken in Peshawar that simultaneously inform patients and their families about the infectious agents behind acute gastroenteritis *and* about the behavioral links to teething children. Parents and staff should be encouraged to understand the differences between causal relationships, and associative ones; but simultaneously, local structures of authority in health care must value and seek out qualitative forms of data from the social, political, and religious contexts. At the very least, prevention and intervention would respect that this differentiation is not universal. Pinpointing these simultaneous plausible causes of acute gastroenteritis in this patient population will allow for directed, well-informed initiatives to be taken. The study results were presented to the newly hired head of the hospital in hopes to strengthen in-house pediatric training directives. They await further discussion in published form to share among hospital staff.

As a pluralistic society, Pakistan often encompasses several ethnomedical systems, and there is evidence that biomedicine has an "incomplete" authority here, since even its practitioners have competing ideas of cause and effect [46]. Explanatory models of *both* parents and medical personnel are relevant to the prevention and treatment effort. They show important contrasts between lay and professional discourses, and suggest the most efficient targets for improving adherence and understanding in treatment.

We propose brief but intensive and holistic ethnographic strategies to assess the lived experience of patients in their home environments, and to understand the context of staff–patients relationships. Local systems of authority, knowledge sharing, gender hierarchy, the diversity of explanatory models across all actors, information about resource allocation within households, and how education and treatment interactions between staff and patients, are all necessary variables for informed patient care. While great strides have been made in the area of affordable medications, acute gastroenteritis remains the second leading cause of death in children under the age of five. Failure to

take into account these complex social variables has distinctive impacts on the continuation of these epidemics. More holistic approaches to health care and education are a constructive way forward.

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[1] Dr. Naureen realized that teething does not cause acute gastroenteritis when she began her pediatric rotations.

TITLE: Ethnomedical and Socioeconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawarite Children

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ABSTRACT:
This article considers ethnomedical knowledge and practices among parents related to contraction of acute gastroenteritis among children in Peshawar, Pakistan. Research methods included analysis of the Emergency Pediatric Services' admission register, a structured interview administered to 47 parents of patients seen in the Khyber Medical College Teaching Hospital, semi-structured interviews of 12 staff, and four home visits among families with children treated at the hospital. The use of native research assistants and participant observation contributed to the reliability of the findings, though the ethnographic, home-visit sample is small. Our research indicated that infection rates are exacerbated in homes through two culturally salient practices and one socioeconomic condition. Various misconceptions propagate the recurrence or perserverance of acute gastroenteritis including assumptions about teething leading to poor knowledge of disease etiology, rehydration solutions leading to increased severity of disease, and diaper usage leading to the spread of disease. Additionally, ~~Additional~~hospital ~~l information about~~ structures of authority and gender hierarchy were found to impact hospital interactions, the flow of information, and its respective importance to the patient's parents leading to possible propagation of disease. ~~as they impact the illness experience are also reviewed.~~ These ethnographic data offer a relatively brief but targeted course of action to improve the effectiveness of prevention and treatment efforts. [Peshawar, Pakistan; Gastroenteritis; Ethnomedical Knowledge; Teething; Diapers]

Introduction

Acute diarrheal disease in children is a major concern in both developing world and politically violent contexts. The social and economic circumstances that normally create food and water insecurity are exacerbated in these areas by weakened medical infrastructures and limited resources, producing epidemic levels of disease in the already vulnerable population of children under the age of 5. Even where biomedical intervention and education is present, transmission rates can remain severe because of diverse cultural and socioeconomic factors, as was recently discussed by Nurul Huda [1]~~et al. (2012)~~. The difficulty of reducing diarrheal infection through biomedical interventions alone highlights the need to complement medical education and oral rehydration therapies with culturally-informed strategies and community awareness. As Vecchiato, Zwane and

Kremer ~~(2007)~~ demonstrated for tuberculosis control and diarrheal disease (respectively), anthropological research is useful for identifying the cultural correlates of disease, particularly those which determine patient utilization of available, proven prevention techniques [2,3].

We therefore conducted a brief ethnographic study to better understand the context of acute pediatric gastroenteritis in Peshawar, Pakistan, which is a major educational, political and business center of Khyber Pakhtunkhwa. It is a culturally diverse city near the border of Pakistan and Afghanistan—currently a dangerous site of terrorist violence and heavy refugee flows. This research illustrates the utility of ethnographic methods for understanding, even in short research periods, the impact of complex patient lifeworlds on willingness to follow biomedical advice.

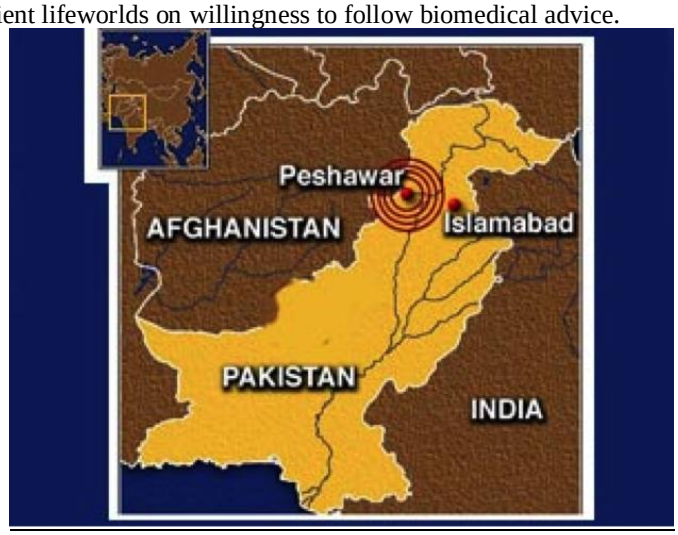

Figure 1. Map of Pakistan
source: http://pakistanhindupost.blogspot.com/2010/06/hindu-community-in-nwfp-or-khyber.html

Background

Gastroenteritis, the inflammation of the gastrointestinal tract, is a well-known illness that plagues over 111 million children under the age of five worldwide annually of which 1.3 million die annually [4,5]. It often leads to ~~severe~~ dehydration and death. In low-income countries, acute gastroenteritis is the second leading cause of death among infants and children under the age of 5 [6]. Regional differences of global deaths due to diarrhea are large with proportionate mortality in Southeast Asia account for 31.3% of deaths [7]. ~~Viruses and bacterial causes of infectious gastroenteritis include rotavirus, norovirus, calicivirus along with *Campylobacter*, *Vibrio cholerae*, *Salmonella*, *Shigella* and *E. coli*.~~ Exposure to these viral and bacterial infectious organisms occurs primarily through consumption of contaminated food and drink. Fecal to oral transmission is facilitated by insanitary conditions. Prevention of transmission involves improvement of sanitary conditions, health education, and nutrition [8]. As such, anthropological research and quantitative methods are complementary in assessing the extent and reason behind

diseases propagation, and in identifying effective strategies in socially complex and pluralistic health care settings [9,10,11]

Although the causal mechanisms of acute gastroenteritis have been well established, the contextual reasons for their occurrence in any given place vary. Factors include economics and poverty level, sanitation infrastructure, cultural and historical factors related to sanitation, and the behaviors and beliefs of patients [12]. Deprivation manifested by household crowding and low maternal education has also been identified as being correlated to increased transmission [13]. Identified behavioral factors affecting transmission include sub-optimal breastfeeding duration or practices [14], storing food at room temperature rather than refrigerating, failure to wash hands, failure to dispose of feces hygienically, and drinking contaminated water [15].

In the research conducted by Mumtaz, Ahmed and Ali , the factors mentioned above apply to the Afghan refugee population, which lives in poor hygienic conditions and among large families. They report that children are "not properly looked after and hand washing is not practiced" [16]. Similar observations were made in the study conducted by Nagamani in Indonesia and Ghana [17]. They remind us that the increased infection rate in children under five might also have been due to the immunologic immaturity of this age group, particularly those under the age of two, through early weaning and contaminated food and water.

~~Cultural and contextual research is increasingly important to hospitals and other policy makers in Peshawar, which has been devastated by war, terrorist attack, and refugee influx since the Soviet War in Afghanistan in the 1980s. Such research must be responsive to local beliefs and events, including the constantly changing conditions of war as well as the multi-cultural aspects of refugee zones.~~ Hospitals and policy makers are developing strategies to encourage prevention, home treatments, appropriate health seeking, and treatment compliance. To this end, cultural and contextual is needed to aid strategy development for this setting. This research is increasingly important to hospitals and other policy makers in Peshawar, which have been devastated by war, terrorist attack, and refugee influx since the Soviet War in Afghanistan in the 1980s. Such research must be responsive to local beliefs and events, including the constantly changing conditions of war as well as the multi-cultural aspects of refugee zones [18,19]. As such,we conducted a brief but multi-faceted ethnographic study to better understand the cultural and contextual factors that might influence transmission and treatment adherence for acute gastroenteritis among Peshawar children.

Research Setting

Peshawar has not been formally studied for risk factors and prevalence of acute gastroenteritis. Crude estimates from the Hayatabad Medical Complex, a teaching hospital in Peshawar, indicate that acute gastroenteritis accounts for 25% of all admissions to the pediatric unit of the hospital in 2004 [20]. Our objective was to supplement these data with up-to-date information and speak to factors leading to the prevalence of acute gastroenteritis.

Located twenty miles from the Afghan border, Peshawar, Pakistan is filled with refugees that fled to Pakistan during the Soviet War of the 1980's and the current war in Afghanistan. The devastating floods of 2010 in Pakistan also displaced a large population of people that are now living in Peshawar. Peshawar is the provincial capital of the

Khyber Pakhtunkhwa province of Pakistan. Its neighborhoods range from refugee encampments to urban dwellings. This unique and diverse population is of low socioeconomic status and comprises a significantly underserved area. There are biomedical, local, and government based health care resources, although biomedicine is broadly regarded as the most effective. This combination of factors made Peshawar an excellent site for understanding cultural and contextual factors in treatment and control of child gastroenteritis.

To date, Peshawar has not been formally studied for risk factors and prevalence of acute gastroenteritis. Crude estimates from the Hayatabad Medical Complex, a teaching hospital in Peshawar, indicate that acute gastroenteritis accounts for 25% of all admissions to the pediatric unit of the hospital in 2004 [15]. Part of our research sought to supplement this data.

Methods

Ethnographic research was conducted in Khyber Medical College Teaching Hospital, which serves as a central treatment facility for the Peshawar region. The Emergency Pediatric Services (EPS) and the Out-Patient Department (OPD) where all gastroenteritis patients are seen became the clinical home of the project. In Khyber Teaching Hospital, the OPD primarily focuses on chronic gastroenteritis patients: those with diarrhea for greater than 14 days. Patients who suffer from diarrhea for less than 14 days are diagnosed with acute gastroenteritis and are cared for in the EPS. These two wards offered important contrasting perspectives on the chronic versus acute forms of gastroenteritis, and resulting hospital admissions, in the region. Analysis of the EPS admission registry from June and December 2011 focused on the key words 'diarrhea' and 'acute gastroenteritis' (or 'AGE'). All patients who had diarrhea or 'AGE' written under diagnosis was counted as an acute gastroenteritis patient. This review facilitated the collection of a seasonal (summer and winter) incidence rate of acute gastroenteritis in the region (**Table 1**).

Table 1. Emergency pediatric services admissions records for Summer and Winter months of 2011.

	Gastroenteritis	**Other**	**Total**	**Percent**
Total	4,920	7,080	12,000	41%

Approximately 200 patients were seen per day in the EPS, or approximately 12,000 patients' total - 6,000 in June of 2011 and 6,000 in December of 2011. Of these, 58% of June patients were afflicted with acute gastroenteritis, compared with 24% in December. In other words, about 120 out of 200 patients per day in the summer months and 50 out of 200 patients in winter months came to Khyber Teaching Hospital's Emergency Pediatric Services with acute gastroenteritis. The effect of falling ill in the warm and wet period of the year on the duration of diarrhea may be due to seasonal variations in the transmission of different etiologic agents (Sharma et al, 2012). During the warmer periods, the bacterial load increases by rapid growth in contaminated foods and possibly water and increases the risk of severe disease [17]. Viral diarrhea is more prevalent during the cooler months [18].

Table 2. Gastroenteritis questionnaire.

Gastroenteritis Questionnaire
Demographics
Basics/ Background
Household Questions
Primary Caregiver Questions
Water
Food
Symptom History

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We then conducted a comprehensive 52-question hospital-structured interview and questionnaire which addressed patient demographics, ethnic and religious background, household characteristics, primary caregiver information, an overview of water and food resources, and an assessment of the parent's knowledge of the disease. The objective of the questionnaire was three-pronged: to assess the patient's background, possible underlying causes of disease propagation, and prior disease knowledge (**Table 2**). All patients under the age of five who came to the EPS with primary complaint of diarrhea between 10am and 3pm during the thirty-day study period were invited to participate in the study. Only those patients whose children were over the age of five and did not have a primary complaint of diarrhea were excluded. Recruitment yielded a sample of 47 patients under the age of five whose accompanying parents completed a comprehensive, semi-structured interview and 52-item questionnaire.

Local research assistants were employed for ease of communication, including one local nurse who was recruited based on her Pashto language knowledge and trained on how to translate and interpret patient information. The nurses' biases may include the summarization of patient communication and interpretation of disease descriptions. After consent procedures, all interviews were conducted in either Urdu or Pashto based on the patient's preference and recorded using a handheld recorder so that parents could be invited to elaborate on their responses. Interviews were conducted in the EPS unit, OPD unit, or patient's home and ranged from 15 to 45 minutes in length. Parents were given an antibacterial soap as a gift for their time. These gifts were considered an incentive to participate in the research and had the added benefit of emphasizing the importance of sanitation.

The questionnaire addressed patient demographics, ethnic and religious background, household characteristics, primary caregiver information, an overview of water and food resources, and an assessment of the parent's knowledge of the disease. The objective of the questionnaire was three-pronged: to assess the patient's background, possible underlying causes of disease propagation, and prior disease knowledge.

Questionnaire responses along with general observations were documented and later grouped into pertinent topics including sanitation, water usage, counseling, disease, expectations, hierarchy, socioeconomic causes, and cultural values. Interview responses were analyzed through grounded analysis and discussion of thematic content to consensus between both authors. Items mentioned by at least 5 different informants were considered thematic. The themes reported below were raised by at least 9 different informants and were, therefore, considered salient.

The structured interviews with parents were complemented by semi-structured interviews with doctors, nurses and staff members regarding water sanitation, hygiene, and the political atmosphere. A total of twelve staff in four different professional positions were interviewed.

The specific circumstances and conditions in Peshawar at the time made this a challenging research site. The U.S. Department of State believes the situation to be sufficiently dangerous that it has discouraged American citizens from traveling to Pakistan. Ms. Zaidi was able to secure access due to her own status as a second generation Pakistani-American who is fluent in Urdu, has spent extensive time in Pakistan and is familiar with local customs and norms. Additionally, through previous work and personal connections, Ms. Zaidi had the support of a network of physicians and hospital administrators in Pakistan. Her knowledge of local customs and ability to quickly integrate based on her ethnic heritage were critical to secure access to patients, data and resources needed to make this project a success.

We took a number of additional steps to supplement Ms. Zaidi's own knowledge and experience. First and foremost, Ms. Zaidi maintained daily contact with a university police officer (from her host university and IRB institution) and hired a local driver / security guard to help her navigate the neighborhoods of Peshawar safely. Additionally, an interpreter fluent in the local language (Pashto) was brought on to the team to ensure that respondents were able to provide adequate color in their interviews in whatever language they were most comfortable. Three Peshawar research assistants were compensated at rates appropriate for their location and skill. They were primarily used to help interview participants and record data in the form of photographs of participants and some of their local water sources. Neutral probes and prompts were used in interviews, consistent with ethnographic interviewing techniques, and longer narratives were encouraged given the ethnographic nature of the research.

~~Parents were given an antibacterial soap as a gift for their time. These gifts were considered an incentive to participate in the research and had the added benefit of emphasizing the importance of sanitation.~~

~~The structured interviews with parents were complemented by semi-structured interviews with doctors, nurses and staff members regarding water sanitation, hygiene, and the political atmosphere (**Table 3a**). A total of twelve staff in four different professional positions were interviewed (**Table 3b**).~~

~~**Table 3a.** Staff questionnaire.~~

~~**Staff Questionnaire**~~
~~Credibility~~
~~Local/ Hospital Sanitation~~
~~Patient Population~~
~~Patient Interaction~~
~~Local Government~~

~~**Table 3b.** Types of staff interviewed.~~

~~**Staff Interviewed**~~	
~~Doctor~~	~~5~~
~~Nurse~~	~~5~~
~~Nutritionist~~	~~1~~

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~~Janitor~~	~~1~~

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~~Three Peshawar research assistants were compensated at rates appropriate for their location and skill. They were primarily used to help interview participants and record data in the form of photographs of participants and some of their local water sources.~~

Ms. Zaidi conducted home visits and unstructured interviews at four patients' homes. There, patients and their female family members were questioned about their living environment, practices related to sanitation, water sources, and their explanatory models of acute gastroenteritis ~~(**Table 4**)~~ [21].

~~**Table 4.** Field questionnaire.~~

~~**Field Questionnaire**~~
~~Food Preparation~~
~~Food Handling/ Prioritization~~
~~Local Environment~~
~~Water Source~~
~~Cultural Practices~~
~~Refugee/ Migrants~~
~~Local Government~~

Ethnographic methods of immersing oneself in other cultures are important for the purpose of capturing full contextual detail from patients' lifestyles, and is particularly important for cross-cultural work in which patients come from a multitude of ethnicities and backgrounds (as in refugee zones). These methods also allow for additional, alternative perspectives on patients' lives for which simple, hospital-based questionnaires would be inadequate by themselves.

Finally, although our goal did not include a complete study of the refugee experience and context of violence, a note about these variables is necessary. During our research period alone, two bombs killed over 60 people, including a doctor from Khyber Medical College Teaching Hospital. Patient #40 lived in the neighborhood of Bara, where terrorists and extremists often gather. The patient's mother complained that normal people could not leave their home for days at a time and were stuck in one room: "the diarrhea is due to unsanitary conditions, but Taliban (a fundamentalist Muslim political movement in Afghanistan) and police are around my house, I can't leave". Thus, participant observation allowed us to assess sanitation levels from an etic perspective and to observe the daily practices that might affect patient compliance with biomedical instructions, and ultimately the prevalence of acute gastroenteritis.

Ethics Statement

This study was approved by the Institutional Review Board of Southern Methodist University and written informed consent was obtained from all subjects.

Ethnographic Results~~/ Discussion~~: Cultural Factors affecting Diarrheal Infections

From EPS records reviewed on site, a~~A~~

~~cute gastroenteritis is the second leading cause of death in children under the age of five in developing countries. As such, children under the age of five from Khyber Teaching Hospital, a major government run hospital in Peshawar, were selected to participate in the study.~~

~~Results: Quantitative~~

~~In addition to interviews, EPS data was analyzed and resulted in the following findings: a~~approximately 200 patients are seen per day in the EPS, approximately ~~, or approximately 12,000 patients' total—6,000 in June of 2011 and 6,000 in December of 2011. Of these 12,000 patients,~~ 41% of whom came in with a primary complaint of acute gastroenteritis **(Table 1)**. Our sample of 47 patient families during a period of 30 days in the Winter of 2011 is non-representative, but offers insights into the beliefs, practices, and knowledge of this large patient group. Our ethnographic data point to three salient local practices in contraction of pediatric gastroenteritis. They are: (1) teething and its relationship to gastroenteritis, (2) the use of rehydration solutions, and (3) diaper usage.

Table 1. Emergency pediatric services admissions records for two select months of 2011.

	Gastroenteritis	Other	Total	Percent
Total	4,920	7,080	12,000	41%

~~Results: Cultural Factors affecting Diarrheal Infections~~

~~Ethnographic data point to three salient local practices in contraction of pediatric gastroenteritis. They are: teething and its relationship to gastroenteritis, the use of rehydration solutions, and diaper usage.~~

~~Figure 2. A participant at a field site visit with visibly soiled pants.~~

(1) Teething

Teething was described the emergence of new baby teeth and often a subsequent chewing of objects to alleviate pain. In Peshawar, eleven out of 47 parents questioned (23%) cited a link between acute gastroenteritis and teething **(Table 2)**. 9% cited a link without prompting, and an additional 7 parents (15%) reported a link when asked directly. This belief led parents to engage in certain measures or lack of oversight that might exacerbate, rather than ameliorate gastroenteritis, a problem that has been documented in several developing contexts. These actions include not actively preventing their children from putting contaminated foreign objects in their mouth. In a study of maternal beliefs concerning diarrhea in North India ~~(Gupte and Sasan 1983)~~, more than 50% of 600 mothers blamed their children's diarrhea on teething. Similar beliefs have been reported from other countries such as Nepal [22,23]~~(Stapleton 1989)~~.

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Table 2. Teething a cause of diarrhea

Response	Number of Participants	Percentage
Yes	11	23%
No	36	77%
Total	47	100%

Notably, hospital staff members were also likely to affirm a relationship between teething and contraction of gastroenteritis. The~~Dr. Ahmer Jan (all names are pseudonyms),~~ head of the Malnutrition Unit at Khyber Teaching Hospital, explained that "kids put their dirty hands and dirt in their mouth especially when teething, which causes them to contract acute gastroenteritis." Conversely, ~~Dr. Naureen~~ a pediatric physician intern in the children's ward—attributed causality not to dirt, but to the stress a child undergoes when his/her teeth first being to emerge. She believed that acute gastroenteritis contracted in this manner is self-limiting and resolves on its own within two to three days. Additionally, a nurse~~Nurse Khulsoom~~ in the EPS department also believed teething causes acute gastroenteritis. Misconceptions or oversimplification on the part of parents of the causal pathways may be a result of interactions between physicians and parents. Physicians often asked parents if the child was teething, and immediately afterward wrote a prescription for medication to treat gastroenteritis without further investigation. The conflation of correlation and causation is not uncommon, and several nurses, doctors, and nutritionists, along with parents, cited teething as a cause of acute gastroenteritis.

We were particularly interested in how informants expressed the relationship between teething and acute gastroenteritis. Their explanations of the relationship spanned a wide range: no explanation; the stress or pain of teething ("the child is in a lot of pain"; and "[I] gave my other children oral drops that I put in their water to ease the teething pain so that they would not be in pain and have acute gastroenteritis"); the increased exposure to dirt or infectious agents associated with greater mobility at this age; or the increased exposure to dirt or infectious agents associated with putting hands and items in the mouth. Research from Dr. Macknin indicates that in actuality teething causes children pain, which leads to an increase in the number of foreign objects the child puts in his or her mouth [24]. While the mastication of these typically unhygienic objects often leads to acute gastroenteritis, the mere emergence of teeth in babies does not. Since even hospital staff can operate under these beliefs, it will be important that prevention efforts ascertain the explanatory models of parents and providers *as part of* prevention and intervention.

(2) Rehydration Solutions

Rehydration solutions are essential in preventing dehydration that is the primary cause of death associated with diarrhea.. Oral Rehydration Therapies, or ORT, can include cost effective medicine or dietary supplements that help manage acute

gastroenteritis symptoms. Newer ORT's fortified with Zinc are quite effective and are widely used in the region to shorten the duration of diarrhea [25]. Improper water to ORT sachet ratio along with unclean water, however, can delay recovery. Additionally, certain local approaches to rehydration worsen acute gastroenteritis.

Questionnaire responses and personal narratives in our research illustrated that there was a surprisingly high rate of tea and *sherbet*, a local sugary drink, usage in children. Seven out of 47 parents (~15%) cited feeding their children either tea or *sherbet* to remedy dehydration from acute gastroenteritis. One mother complained to the nurse "my child won't drink any water when dehydrated" and so the nurse recommended adding lemon and sugar, or Tang, an orange flavored drink mix available in local stores, to make it tastier for the child.

Chai and *kava* are common hot beverages in Peshawar, Pakistan. *Kava* is a native green tea that is drunk throughout the day by all socioeconomic classes regardless of outdoor temperature. While teas are commonly recommended to patients sick with a cough and are used routinely around the world for medicinal purposes, they can actually be harmful in the case of acute gastroenteritis [26]. These local teas are infused with sugar that worsens the rate of dehydration [27]. A typical homemade oral rehydration solution consists of six teaspoons of sugar and ½ a teaspoon of salt in a liter of boiled water [28]. *Chai* and *kava* have anywhere from 1 teaspoon to 2 ½ teaspoons of sugar in .25 liters (one cup).

Excessive amounts of sugar can make diarrhea worse and prevent intake of important minerals necessary for the child, whom is often dehydrated [29] ~~(Meeuwisse 1983)~~. The same can be said about lemon and sugar water, as well as Tang flavored water. Tea or *chai* contains excessive concentrations of aldehyde (a carbon double bonded to oxygen, a hydrogen and an R group) and low concentrations of sodium. The inappropriate glucose-to-sodium ratio impairs water absorption, and the large osmotic load creates an osmotic diarrhea, further worsening the degree of dehydration [30]. These sugared drinks, if not properly made, can actually worsen acute gastroenteritis symptoms. Furthermore, tea has caffeine (a diuretic), which can also possibly worsen acute gastroenteritis [31].

Communication of instructions for ORT use is an additional cause for concern. Many ORT medications are packets of medication which must be prepared in a specific way; namely, mixed into a precise quantity of boiling water. The written instructions pose an issue for this population, as 75% of the respondents interviewed were illiterate (**Table 3~~5~~**). These sachets are purchased over-the-counter as per the doctor's instruction and have explicit directions on how to prepare the ORT on the back **(Figure 2)**. The patient's family is told to purchase the ORT and is typically given a quick overview of the purpose of it and a times how to prepare it by the prescribing physician. Many women simply pour the packet into what they feel is a sufficient pot of water. Women who cannot read the instructions are limited to instructions that they receive orally. They are at a disadvantage because their compliance is dependent on their ability to remember these oral instructions. This likely also limits their access to any supplementary written explanation of the medication.

Table 3~~5~~. Mother literacy levels.

~~Row Labels~~	~~Count of ID #~~	~~Percentage~~

~~Yes~~	~~11~~	~~25%~~
~~Partially~~	~~1~~	~~2%~~
~~No~~	~~33~~	~~73%~~
~~Total~~	~~45~~	

Response	Number of Participants	Percentage
Yes	11	25%
Partially	1	2%
No	33	73%
No Response	2	-
Total	47	100%

Pakistani Oral Rehydration Salts

Figure 2~~3~~. The boxed words on both pictures display the brand of the ORT, Davisalts, in English and Urdu. In the leftmost image, the text surrounding the '1' in the red circle states "For 1 litre of water" in English. The smaller writing on the packet in the leftmost picture is the first part of the instructions for making ORT.

The literacy issue was illustrated in the children's ward one day, when patient #24's mother was chastised by the doctor. She had yet again over-diluted her child's baby formula, and therefore her child was not receiving sufficient nutrients. Staff members reported that over-dilution is a common problem not only with bottle feeding, but with various medications as well. Yet literacy is not the only problem in this scenario; poor

methods of communication and impatience with differences in explanatory models due to lack of resources exacerbate illness through under-effective treatment efforts. Parents may misunderstand biological processes and hold incorrect perceptions about medication or treatment. Additionally, clinicians may fail to give information in a way that can be understood and utilized by parents, given the context of their lives, their literacy, and their resources.

(3) Diaper Usage

Socioeconomic disparity was not assessed, but was manifest in parents' varied access to nutritional foods, in sanitation, and in the use of diapers versus cloth or no diapers (**Table 4**). Store-bought diapers sufficiently contain child's waste and minimize the risk of oro-fecal disease; however, they are expensive and cannot be reused like cloth diapers. Cloth diapers, while more economical, are unable to fully contain children's waste without a protective external lining, increasing the likelihood of exposure to fecal material. Foregoing diapers altogether is least expensive, but also least likely to contain children's waste.

Table 4. Diaper Types.

Diaper Type	Number of Participants	Percentage
Store-bought	9	45%
Cloth	8	40%
No diaper	3	15%
No Response	27	-
Total	47	100%

Acute gastroenteritis is spread via fecal-to-oral transmission as well as several alternative mechanisms [32]. In resource-poor settings, poor fecal containment and inadequate washing practices promote the quick spread and reinfection of children with acute gastroenteritis [33]. Household crowding increases the likelihood of exposure to unsanitary conditions and will be particularly problematic in households with young children [34]. Given the climate of violence in Peshawar today, crowded household conditions already common in the poorest areas are made worse by fear of gathered terrorists in the neighborhood.

To better understand parents' contingent strategies in this atmosphere of violence, the clinical questionnaire was modified during the field season. Twenty of the 47 (43%) patient's parents were asked to specify the type of diaper, if any, they used for their children. This sub-sample offers insight to not only socioeconomic factors in fecal to oral transmission, but also the household circumstances that impact spread and reinfection of acute gastroenteritis. Twelve out of the 20 or 60% of those patient's parents interviewed said they used cloth or no diapers for their children. Two of those that used store-bought diapers acknowledged that they "didn't have children for years and so now they are spoiled with store bought diapers". Cloth diapers and clothing alone (no diaper) allow leakage of fecal material onto secondary surfaces such as bed sheets, the floor, or the

hands of people caring for the child. This is particularly an issue when multiple children and parents sleep on the same surface

Use of cloth, disposable, or no diapers was explained here as an economic issue and a cultural factor or explanatory model difference. We acknowledge that certain contextual and economic factors are beyond the ability of clinicians to ameliorate, and possibly even address, including warzone and terrorist violence in neighborhoods. In these circumstances, acknowledgement of and sensitivity to these conditions can be helpful. At Khyber Teaching Hospital, for example, food supplements are given to patients in the Malnutrition Unit. Although disposable diapers would have been helpful in reducing fecal to oral transmission, they did not appear to be a central element of prevention or treatment resources.

~~Results/~~ Discussion & Conclusion:

Acute gastroenteritis is prevalent among children in Peshawar, Pakistan and has several cultural and contextual factors that contribute to transmission rates. This research suggests that themes of teething, rehydration strategies, diaper usage, and hierarchy will be important for future prevention and treatment. Local views about teething and its connection to acute gastroenteritis affect the actions that parents take to avoid transmission. Finally, lack of information about the proper and most effective use of rehydration solutions potentially worsens acute gastroenteritis symptoms, as does inadequate containment of children's waste.

How might these ethnographic lessons be productively applied through local health care structures and authorities?~~This leads to the final salient theme from our analysis, which lies in the structures of authority and gender hierarchy in Peshawar. This has implications for any future change in educational and treatment efforts.~~

~~Gender and Hospital Hierarchy~~

~~A fourth theme emergent from this research was of a different character than the first three we have reviewed, but sufficiently relevant in ethnographic interviews to review.~~ Anthropologists and other social scientists have shown the value of in-depth, local knowledge for effective health interventions, regardless of the location [35, 36, 37]. But sites of conflict, danger, extreme resource pressure like refugee camps are particularly vulnerable to the challenges of conflicts in healing modalities or beliefs, limited access to health care, and over-taxed health care infrastructures and staff [38, 39]. Many examples may be found; Halvorson's work on women's role in making or breaking the "chain of [diarrhea] contamination" within the household sphere is informative in this regard [40]. Sustained changes in behavior as well as the enhancement of women's capacity to solve health problems were found to be crucial to the objectives of rural water, sanitation and diarrheal disease control programs [41]~~(El-Katsha and White, 1989)~~. Caregivers frequently fail to recognize children's diarrhea, especially among younger infants and when illness signs are less severe [42]. Mothers' responses to diarrheal diseases are mitigated and shaped by community values, belief systems, gender dynamics, and the socioeconomic circumstances in which they live, work, and raise families [43]. Our research confirms that programs which take mother's beliefs and resources into

account are substantially more likely to succeed than those that do not. This gendered finding is a good example – although only one example – of the importance of ethnographic data to effective health care.

Peshawar is a patriarchal society in which the eldest male governs the household [39]. Women are the primary caretakers of children, and in the hospital only women were allowed inside the children's ward, which Ms. Zaidi observed and noted through participant observation and personal narratives. Additionally, there is a distinct hierarchy among the hospital personnel, which impacts interactions, the flow of information, and its respective importance to the patient's parents [44]. Women and their children primarily frequented the children's wards in the hospital. On occasion, men would enter EPS with their children, primarily when speaking to the physician, but whenever the child had to be sent in to the EPS for injections or IV rehydration, men (even fathers) were not allowed to enter the EPS. That children's hospital wards are the domain of women attests to the patriarchal nature of the Peshawarite gender roles. Women are universally the primary caregivers [45]. Men accompanied their women primarily for their protection and supervision, and not for their role in childcare. This local ethnographic and qualitative data, even acknowledging its small scale and sample, has provided inexpensive but crucial information about the social context of health care in Peshawar, including gender norms for home care, spending on medications, and hygiene.

But to ensure ethnographic findings are applied, the authoritative structures within health care systems must also be taken into account. There is usually a clear professional hierarchy in public hospitals such as Khyber Teaching Hospital. Doctors are at the top of this chain, after which comes nurses and nutritionists followed by other personnel. This hierarchy is evident in the interactions between doctors and nurses, and in the interactions of both medical groups with patients. While there is often friendly banter and conversations between doctors and nurses, quite often one of the physicians would raise his voice at one of the nurses for not following his directions. A nurse in the EPS department at the beginning of data collection told Zaidi, "the doctor is being nice and putting on a good show for you, but he scolds us and the parents often". Similarly, doctors and nurses berate their patients' parents. When asked why there appeared to be a lack of patience with parents, ~~Nurse Tasneem~~a nurse explained, "One, many parents want their child to be cured right away. They do not comprehend that the process will take a while and they do not want to wait. Two, parents feel like they need injections and that they have not been properly treated until they receive antibiotics or injections". These circumstances frustrate doctors and nurses who end up berating parents for their lack of understanding and knowledge. Yet despite the scolding and hierarchy, and regardless of how the patient and his or her parents felt about the doctor, they greatly valued the doctor's opinion and followed their advice when feasible and properly understood. These social and hierarchical variables impact not only how care and education are delivered, but the ways in which patients can receive information and collaborate in health management.

Peshawar was chosen as a study site to highlight the impact of its unique context. Our research contributes data on regionally pertinent cultural beliefs and patterns of behavior relevant to the propagation of acute gastroenteritis. However, we also contribute to the growing body of literature that calls for collaboration between quantitative and clinical strategies, on the one hand, and qualitative studies of context, on

the other. The widespread presence of teething explanations for diarrhea particularly held by practitioners who have significant authority in the community, indicates that these beliefs will not be easily dismissed. Preventive measures must be taken in Peshawar that simultaneously inform patients and their families about the infectious agents behind acute gastroenteritis *and* about the behavioral links to teething children. Parents and staff should be encouraged to understand the differences between causal relationships, and associative ones; but simultaneously, local structures of authority in health care must value and seek out qualitative forms of data from the social, political, and religious contexts.

At the very least, prevention and intervention would respect that this differentiation is not universal. Pinpointing these simultaneous plausible causes of acute gastroenteritis in this patient population will allow for directed, well-informed initiatives to be taken. ~~Explanatory models of *both* parents and medical personnel are relevant to the prevention and treatment effort. They show important contrasts between lay and professional discourses, and suggest the most efficient targets for improving adherence and understanding in treatment.~~ The study results were presented to the newly hired head of the hospital in hopes to strengthen in-house pediatric training directives. They await further discussion in published form to share among hospital staff.

~~The widespread presence of teething explanations for diarrhea particularly held by practitioners who have significant authority in the community, indicates that these beliefs will not be easily dismissed. Preventive measures must be taken in Peshawar that simultaneously inform patients and their families about the infectious agents behind acute gastroenteritis *and* about the behavioral links to teething children. Parents and staff should be encouraged to understand the differences between causal relationships, and associative ones; but at the very least, prevention and intervention would respect that this differentiation is not universal. Pinpointing these simultaneous plausible causes of acute gastroenteritis in this patient population will allow for directed, well-informed initiatives to be taken. Explanatory models of *both* parents and medical personnel are relevant to the prevention and treatment effort. They show important contrasts between lay and professional discourses , and suggest the most efficient targets for improving adherence and understanding in treatment. To address these variables in parent beliefs and knowledge, we propose brief but intensive and holistic ethnographic strategies to assess the context of staff–patients relationships. Local systems of authority and gender hierarchy, as well as the diversity of explanatory models across all actors, , information about the way that resources are allocated within households, and how education and treatment occur within hospital settings, are all necessary variables for informed patient care. While great strides have been made in the area of affordable medications, acute gastroenteritis remains the second leading cause of death in children under the age of five. Disparities among explanatory models continue because of cultural, ethnic, or class differences, and education must recognize and address these disparities constructively.~~

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As a pluralistic society, Pakistan often encompasses several ethnomedical systems, and there is evidence that biomedicine has an "incomplete" authority here, since even its practitioners have competing ideas of cause and effect [46]. Explanatory models of *both* parents and medical personnel are relevant to the prevention and treatment effort. They show important contrasts between lay and professional discourses, and suggest the most efficient targets for improving adherence and understanding in treatment.

~~Explanatory models from health professionals and patients' parents explained beliefs and expectations in regards to teething, rehydration methods, and diaper usage that questionnaires alone would not have been able to elucidate. Critical medical anthropology using even brief ethnographic strategies can promote care that is more informed by the micro level factors, both cultural and structural, placing pressures on patients.~~

~~To address these variables in parent beliefs and knowledge, w~~We propose brief but intensive and holistic ethnographic strategies to assess the lived experience of patients in their home environments, and to understand the context of staff–patients relationships. Local systems of authority, knowledge sharing, gender hierarchy, the diversity of explanatory models across all actors, information about resource allocation within households, and how education and treatment interactions between staff and patients , are all necessary variables for informed patient care. While great strides have been made in the area of affordable medications, acute gastroenteritis remains the second leading cause of death in children under the age of five. Failure to take into account these complex social variables has distinctive impacts on the continuation of these epidemics. More holistic approaches to health care and education are a constructive way forward~~Disparities among explanatory models continue because of cultural, ethnic, or class differences, and education must recognize and address these disparities constructively~~.

Acknowledgements

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~~**Appendix 1:**~~

~~**Appendix 2:**~~

Outbreak ID:	Id Number:

~~**Gastroenteritis Questionnaire**~~

~~Fill in the blank or check **Yes/No/Don't Know** to complete questionnaire.~~

~~**Interviewer** _____ (Initials) **Date of Interview** ___ /___ /___~~

~~**Demographics**~~

~~**1. DOB:**~~

~~**2. Age:** **3. Sex:** **4. Race:**~~

~~☐ Male ☐ Female ☐ Pakistani ☐ Afghani ☐ Asian ☐ Other~~

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Home Address: **5. City/ Area:** **State & Zip:**	Formatted: Centered
Occupation:	Formatted: Centered
Name and Address of Employer, daycare or school:	Formatted: Centered

Basics/ Background

6. Height? _____

_____

7. Weight? _____

_____

8. Immunizations? _____

9. Do you go to school? Yes/ No

10. Where? _____

11. Grade _____

12. How many times have you been to the doctor in the last 6 months? _____

Reason?

Date:_____

Why:_____

Date:_____

Why:_____

Date:_____

Why:_____

Date:_____

Why:_____

Hypothesis-Generating Questions (Ask of Everyone)

Please answer questions as complete as possible. Use back of page for additional space, if necessary.

Household:

13. Single story/ double story?

14. **How many people live in the house?** _____

Relation:_____ **Age:**_____
Relation:_____ **Age:**_____
Relation:_____ **Age:**_____
Relation:_____ **Age:**_____
Relation:_____ **Age:**_____
Relation:_____ **Age:**_____

15. How many rooms are in the house? _____

16. Indoor plumbing? Yes/ No

17. Where do you use the restroom?

☐ A. Inside house ☐ C. Pit
☐ B. Outhouse ☐ D. Anywhere:_____

18. Do you wash your hands? Yes/ No
19. How?

☐ A. Soap ☐ C. Hand Sanitizer
☐ B. Water ☐ D. Other:_____

20. Do you have access to the news? Yes/ No
21. How?

☐ A. TV in House ☐ E. Newspaper
☐ B. TV Elsewhere (where?)
☐ C. Radio in House ☐ F. Other:_____
☐ D. Radio Elsewhere (where?)

22. Do you have any animals? Yes/ No
23. What kind?

☐ A. Cow ☐ C. Cat
☐ B. Dog ☐ D. Other:_____

Primary Caregiver:

24. Who is the primary caregiver?

☐ A. Mother ☐ C. Grandparent
☐ B. Father ☐ D. Other:_____

25. How old is the mother? _____
26. Education level?

☐ A. Primary ☐ C. University
☐ B. Secondary ☐ D. Other:_____

27. Can she read/write? Yes/ No

28. How old is the father? _____
29. Education level?

☐ A. Primary ☐ C. University
☐ B. Secondary ☐ D. Other:_____

30. Can he read/write? Yes/ No

31. Do you know about ORS (use of oral rehydration salts? Yes/ No
32. If so, from where?

❒ A. TV ❒ C. Newspaper
❒ B. Radio ❒ D. Other:_____

Water:

33. What is your water source?

❒ A. Running Water ❒ C. River/ Stream
❒ B. Local Well ❒ D. Other:_____

34. How clean do you think your water is?

❒ A. Very Clean ❒ C. Ok ❒ E. I don't know: Why?
_____
❒ B. Clean ❒ D. Dirty

35. Do you need to treat the water? Yes/ No
36. If so, how?

❒ A. Boil ❒ C. Chemicals
❒ B. Tablets ❒ D. Other:_____

Food:

37.Who prepares the food? _____
38. How?

❒ A. Outside Fire ❒ C. Communal Location
❒ B. Indoor Fire ❒ D. Other:_____

39. Do kids drink milk? Yes/ No
40. Where does it come from?

❒ A. Mother ❒ C. Goat
❒ B. Cow ❒ D. Other:_____
41. If other than mother, is it specially prepared (boiled)? How?
Yes/ No _____

42. Did mother breastfeed? Yes/ No
43. If so, how long?

❒ A. 1 month or less ❒ C. 4 to 6 months
❒ B. 1 to 4 months ❒ D. Other:_____

Biomedical:

44. What do you think is causing the diarrhea? (can pick more than one)

❒ A. Water ❒ C. Sanitation
❒ B. Food ❒ D. Other:_____
45. Whose fault do you think it is that you have diarrhea?
❒ A. Government ❒ C. Medical Providers (Doctors)
❒ B. City ❒ D. Other:_____

46. Why do you think the above?

47. Why do you think you got diarrhea (as opposed to neighbors)/ Why did you come in for it?

48. How do you think your health situation can be changed?

49. How do you feel about the care you get at the hospital? Why?

50. Do you follow the doctor's orders? Y/N

51. Why or why not?

☐ A. Don't understand ☐ D. Other:

☐ B. Too Expensive Explain (all):

☐ C. Don't trust the advice

This page is only for people who got sick. Discard for those who did not become ill.

Symptom History

Did you have any …

[7] Y N DK	SIGNS AND SYMPTOMS	[8] Y N DK	
N ☐ ☐ ☐	nausea	L ☐ ☐ ☐	chills
V ☐ ☐ ☐	vomiting	H ☐ ☐ ☐	headache
D ☐ ☐ ☐	diarrhea	Z ☐ ☐ ☐	backache
B ☐ ☐ ☐	blood in stool	M ☐ ☐ ☐	myalgia (muscle aches)
C ☐ ☐ ☐	cramps	T ☐ ☐ ☐	unusual fatigue (feeling tired)
X ☐ ☐ ☐	constipation	O ☐ ☐ ☐	Other (*if other, specify* ____
F ☐ ☐ ☐	fever (*if yes*, ☐ subjective or ____° (max.))		

Onset and Duration

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On what date did you first feel sick? ___/___/___

___

At what time did you first feel sick?

☐ _____ am ☐ noon ☐ _____ pm ☐ midnight (very *end* of day)

What was your first symptom?

_____

[If applicable] **On what day did you start having the diarrhea (whichever came first)?**

___/___/___

[If applicable] **At what time did the diarrhea begin?**

☐ _____ am ☐ noon ☐ _____ pm ☐ midnight (end of day)

Are you still having any diarrhea now? ☐ yes ☐ no

If no, **how long did the diarrhea last?** ___ minutes ___ hours ___ days

Date of recovery? ___/___/___ **Time of recovery?** _____

Overall, **how long did you feel ill?** ___ minutes ___ hours ___ days

52. Gift Given? Y/N

QUESTIONNAIRE IS COMPLETE.

Table B:

Profession	**Number Interviewed**
Doctors	**5**
Nurses	**5**
Nursing Students	**1**
Nutritionists	**1**

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Acknowledgments:
Jacob Turner- Graduate Student Department of Statistical Science at SMU

. Dr. Naureen realized that teething does not cause acute gastroenteritis when she began her pediatric rotations.

UNIVERSITY OF CALIFORNIA, BERKELEY

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August 20, 2014

Dear Reviewers,

Thank you for the opportunity to revise and resubmit the attached manuscript, "Ethnomedical and Socieconomic Factors in the Prevalence of Acute Gastroenteritis in Peshawarite Children". We are delighted that the Reviewers found such merit in our findings, and we are pleased to have reorganized and clarified the manuscript as they suggested. We respond to each of their comments/queries below. As you will see, we have embraced nearly all suggestions, and made corresponding revisions in the attached version.

Reviewer #1

- There are some important omissions that were not part of the draft and I did not find submitted separately on the journal website. I could not find Tables 1, 5 or 6 which I assume contain the quantitative findings. There is an appendix 1, which has two pie charts, but this is not referred to in the text (and adds little so consider omitting)- Appendix 1 omitted. Appendix 2 is the gastroenteritis questionnaire but is referred to as Table 2. This has been corrected.
- Tables 3 and 4 are instruments, also not provided, but I don't recommend that they are included. Table 3 and 4 have been omitted.
- The paper needs re-organization. I have made some suggestions among the specific comments. The paper, and specifically the results, discussion, and conclusion have been significantly re-organized, and we are grateful for these helpful suggestions. Detailed replies are below.

Specific comments:

- Abstract, line 7; use of native research assistants seems essential rather than novel and description of this in the methods should be adequate. We agree, and have made this conversation more substantial and detailed in the Methods section.
- Abstract, line 8; are the ethnographic samples the home visits? This needs some further clarity. Yes, in part, and these changes are reflected in the Abstract and in the Methods section.
- Abstract, line 10; it is not clear how the misconceptions described impact on gastroenteritis. Does the poor knowledge of disease etiology result in delay in obtaining treatment? more severe disease? it would be great to have some more specific information provided here. What about the ORS has a negative impact? This has been addressed in the abstract. We added information to the Ethnographic Results section that the belief that teething causes diarrhea prevents

mothers from not actively preventing their c children from putting contaminated foreign objects in their mouth. Additionally, it was clarified that unclean water and improper ORT packet and water ratio may delay recovery. Lastly, we summarized this information in the conclusion.

- Abstract, line 14; It states that findings are reviewed. I prefer an abstract that states findings and draws conclusions on how the findings impact prevention, treatment etc and discourage the use of this type of language in the abstract. We have strengthened our conclusions in this regard, including placement of our own findings among other, similar published qualitative studies.
- Citations in the text are not consistent. They are in two forms (numbers in parenthesis and name plus year). Please comply with the journal requirements. Thank you, we have made the necessary changes.

Background:

- Transmission rates can be high but should not be referred to as severe. We have taken this somewhat inflammatory language out in the revised version.
- Low-income country is a preferable term to 'underdeveloped'. Thank you. We accept this suggestion and use it throughout.
- This paper presents data that can impact on prevention and treatment. I would omit information on immunological immaturity as this is not relevant to the topics explored. The passage on "immunological immaturity" is a statement summarizing the findings of another study among children – one by Nagamani et al. (2007). We therefore would prefer to keep this material intact.
- Background first paragraph; It would be useful to include how anthropological research and quantitative methods can be complementary. We have expanded the comment here (in the Background section) but now return to it more substantially in our revised Conclusion. We feel this strengthens the broader applicability of our research.
- Background para 4; The objective of the study needs to be clearly framed. I think what is important to hospitals and policy makers are developing strategies to encourage prevention and home treatment steps, appropriate health seeking, and compliance with treatment. To this end cultural and contextual information is needed to aid strategy development for this setting, otherwise there are many studies that have explored prevention, treatment and compliance. Paragraph 4 has been substantially revised, and we have expanded our conclusion to return to these points of concern as well.

Research setting:

- Clearly state why selecting this site in Peshawar was that relevant to the objective of the study? This is now done more clearly in the Research Setting.

Methods:

- 2nd paragraph; The figures on patients with gastroenteritis are relevant for their selection in this study. However, this paper is not an epidemiological assessment of disease burden or etiology so I would stick to the information that is relevant to respondent selection. Was seasonality part of the consideration? Did you aim to

select across seasons. It does not seem relevant in the methods section to propose underlying reasons for seasonality as there is a large body of literature on this. We have deleted all references to the seasonality material.

- Table 2; The detailed questionnaire is not required for the paper. At most you could consider describing the objective and the topics covered. Details on the difficulties in administering the questionnaire may be relevant for the discussion but do not constitute results. If these data were specifically collected as part of the study, it would be useful to describe the study note taking or similar in the methods. The level of detail included here seems unnecessary, similarly for other questionnaires included in the paper. They can be omitted. We have removed Table 2, Table 4 and Appendix 2, and added only brief comments about our note-taking procedure.
- There are a lot of results in the methods such as hospital admission figures. Ensure that the methods section just describes methods and not findings. We have moved the tabular and quantitative data into the Results section.

Results:

- There is a lot of text in this section that would be part of the discussion, for example, references to similar or contrasting studies. A better way to organize the paper would be to have the results and discussion together and then a conclusion section where the key discussion points are synthesized. This is reasonably common for qualitative studies. It is true that for qualitative research, a substantial amount of text – including quotes, explanation of terms/concepts, and contextual detail – are necessary. For this reason, our Ethnographic Findings section does conform to standard practice for qualitative research. However, in an attempt to address this Reviewer's concern, we have made some cuts to the narrative of our Findings, and moved some of the discussion to the conclusion section.
- The results should start with description of the study population. We have added a description to beginning of Results section.
- Teething seemed to be an a priori topic for exploration since it was in the quantitative questionnaire. This is not mentioned in the methods or the objective. Did it come from qualitative work? Did the ethnography inform the questionnaire design? No, this theme emerged through grounded analysis and coding of the interview notes, which is why it was not mentioned in the Methods or Objectives. We have repeated the source of these themes in the Methods section and in the Results section, to avoid reader confusion.
- I would omit figure 2 as it doesn't add to or complement the findings. The objective is to identify perceptions of diarrhea to aid message development for treatment, care seeking. We have omitted figure 2.
- Pseudonyms; I am not familiar with this style. Alternatively 'female infectious disease physician aged 32 years' or similar may be preferable to providing names, pseudonyms or otherwise. Although pseudonyms are commonly used in ethnographic literature, we agree that their use in this manuscript became cumbersome and uneven. We have therefore used descriptive markers, instead, as suggested.

- Sherbet is the local term and has an entirely different meaning in high income countries; it makes sense to describe what this refers to at the first point that it is mentioned. Use italics for local terms. The requested changes have been made in the Rehydration Solutions section.
- Generally rehydration solutions do not resolve the symptoms but their primary function is to prevent dehydration. They are perceived as medicines, whereas zinc has been shown to shorten diarrhea duration. Make sure that this misconception is clearer in the text. We have made these clarifying changes in paragraph 1 of Rehydration Solutions.
- Ensure that ORS or ORT is chosen and used consistently. Done
- Figure 3; the ORS packet; I am not sure what this adds and would suggest omitting it from the manuscript. The function of this picture is to offer a visual representation of how very little is being done to address the issue of illiteracy.

Discussion:

- If the decision is to keep the discussion separate, rather than incorporate with the findings, then the traditional style of having the discussion should flow from the results rather than introduce new themes should be followed. I did not see the themes of gender and hospital hierarchy emerge in the results. I would include that information in the results and discuss how to mitigate the negative impact. We have re-organized the manuscript to have a single Ethnographic Findings section, and a Conclusion which incorporates relevant literature and additional contextual information from the study that pertain to our recommendations. The material on gender and hospital hierarchy have, therefore, been folded into our concluding comments about HOW results can be applied to achieve better care. We feel this revised emphasis is a clear improvement, as requested.
- What needs to be highlighted is what this paper adds to previous studies. Moreover, the site was chosen to highlight the impact of the unique context, therefore contrast findings with other studies. The discussion can provide a summary of how things may need to be handled differently within the context. According to my earlier suggestion, I would consider including this in the conclusion instead. We have prepared a new Conclusion in response to this request.

Conclusions;

- Much of this section belongs in the Discussion. Including a summary of the way forward/next steps would be ideal for the Conclusion. Proposing additional research with a specific direction or theme is better left for the end of the conclusion. Some of the public health messages that are appropriate have been suggested previously; treat diarrhea with ORS and seek treatment if symptoms persist. Thus tailoring suggestions to the context of this study, and how this can be applicable to other countries encountering similar conflict should be considered. Our new Conclusion better meets these expectations.

Reviewer #2:

- An important piece of information and a good effort to summarize findings. Some formatting and editing may be needed. A brief of comments, kindly follow the pdf for detailed insight. Kindly review tables and figures lables and numbering. We have addressed each of the items in the PDF file, including revisions to the tables and figures.

Methods:

- Kindly mention the inclusion and exclusion criteria.- Inclusion criteria was added to the methods section based on how patients were initially screened to participate in the study.
- The reader may want to know the analysis performed and how data collation took place. A brief summary of the grounded analysis and coding techniques used, standard methodologies for ethnographic data, is now included in the Methods section.
- As mentioned, your interpreter for local language are an important strength in the study, kindly share their recruitment and background. Is there any potential bias in translation or interpreting information? In any case, kindly mention it for your readers. A response to this inquiry was written in the paragraph of Methods section.
- Some of the sections in methodology, after briefly introducing here may be detailed in later sections (a few of results and discussion is found in methods). We have moved the quantitative information to the results section.

Data:

- Is there any table that has summary of responses/results, the authors may consider including any such data. I added such a table to the teething section, however, I do not believe it is necessary since most sections have the data either written out or already in table format.

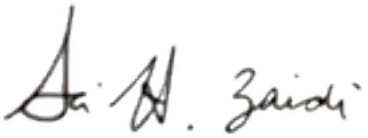
Results and conclusion:

- The local language terms, kindly elaborate them as the journal has readers from international community. The local terms are now italicized and a bit more explanation is offered.
- This is a good effort and informative work, the conclusion may have specific doable recommendations accordingly. Since the author know the study settings best of all, they may consider local context (hospitals and homes) while recommending interventions. We have addressed this in the new Conclusion.
- The authors described that the areas is full of refugees, were any participants some of the refugees. In any case, how do they compare refugees' situation with the local population. Is there any chance that they may have any influence on each others? We address the presence of a high number of refugees in our Methods section, but because sampling was not conducted for a representative balance of refugee and non-refugee, we cannot speak to this population. Instead, we limit our conclusions to characteristics of crowded housing, low education, and local beliefs about teething.

- The attached questions has numerous questions, the responses from all of them (not included in this paper) may not be significant. In any case kindly mention very briefly, since they are part of the questionnaire. This suggestion contradicts one made by another Reviewer. For clarity's sake, we have chosen not to include all questionnaire items in this publication, with gratitude to both reviewers for their suggestions on this topic.

We have enclosed both a clean "Manuscript" file and the "Manuscript with Track Changes" along with this letter. Thank you again for your consideration and we look forward to your response.

Sincerely,



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