A study of treatment preference for diarrhea among Tengger people in Pasuruan, East Java, Indonesia

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Abstract

Purpose – This study aims to describe the treatment preference, especially in relation to traditional medicine, modern health care and a combination of both, in diarrheal cases among the Tengger ethnic minority group.

Design/methodology/approach – A cross-sectional survey was conducted in all eight villages of Tosari District, Pasuruan Regency, East Java Province. Tengger people were major resident in the area for generations. Convenience sampling and a face-validated structured questionnaire were used to recruit and face-to-face interview 377 Tengger people.

Findings – The study found that modern health care was the dominant preference (52%, $n = 196$) selected by Tengger people when they have an episode of diarrhea, compared to traditional medicines and mixed approach. Most respondents opted to visit one facility or to stay at home (64.3%, $n = 242$). Statistical significant relationships were found between treatment choice and age ($p < 0.001$), sex ($p < 0.001$), religion ($p = 0.011$), distance ($p < 0.001$), educational background ($p < 0.001$) and job ($p < 0.001$). A clear pattern between treatment choice and age was revealed with younger groups tended to choose modern health care, while older groups more preferred the traditional approach.

Practical implications – This work could provide an insight that when the young Tengger people are having uncomplicated and common health illness, such as diarrhea, they tend to use modern treatment approach.

Introduction

Indonesia is a diverse country consisting of more than 400 ethnic groups and subgroups with different physical appearances and cultures. Living in a tropical region that is rich in biodiversity has enabled Indonesians to develop their own traditional health systems, including the use of herbs or plants, minerals, animal products or a combination of them, to cure health conditions [1–4]. Across generations, knowledge of these traditional treatments has been passed on, and it is generally believed that today, many Indonesians still preserve the knowledge to treat self-diagnosed minor or major health conditions. This preservation of traditional medicine has received Indonesian government support. Since 1991, the Ministry of Health has published guidelines for home-based use of herbal medicines [3]. In 2007, the Ministry of Health also created a national policy on traditional medicine, described as a "cultural inheritance," by releasing Decree Number 381/MENKES/SK/III/2007 [2]. The latest data from the annual Indonesia National Socioeconomic Survey (Susenas) published by Statistics Indonesia (BPS) demonstrated that in 2014, around 20% of Indonesians who had medical conditions still relied on traditional medicinal treatment [5].

Despite the use of preserved traditional medicine, modern medicine has also been made available by the Indonesian government. A series of national data from 2009–2014 showed the percentage of Indonesians who used modern medicine was stable at around 90% [5]. Although accessibility to modern health care is still unequal across the country, in recent years, the government has taken defined steps to improve accessibility. For example, in 2014, a nationwide insurance program, *Jaminan Kesehatan Nasional* (JKN), was introduced and administered by BPJS Kesehatan [6]. This improvement has affected the choice of treatment types that are selected for ailments.

It is well documented that treatment preference, or health-care utilization in general, is determined, in part, by race or ethnicity. Katz's narrative review [7] shows different preferences for a range of medical procedures, including cardiac revascularization and hip replacement, between American whites and blacks or Hispanics, with the whites, being more likely to select these options than the other races. In general, minor ethnic groups, immigrants for example, seem less likely to use health services [8]. Among these minorities, identified barriers to the use of health services range from local language skills and culture at the patient level to the medical paradigm at the system level [8].

Tengger is one of Indonesia's minority ethnic groups. The Tenggerese predominantly inhabit four regencies of East Java Province, namely, Probolinggo, Lumajang, Malang and Pasuruan [9]. They live around the Bromo-Tengger-Semeru National Park. This ethnic group is unique to the country, as they live in secluded areas and most of them have followed Hinduism for generations, which is neither a dominant religion in Java Island nor Indonesia [9,10]. Previous studies documented the practice of traditional medicine in Tengger communities in all four regencies [11–13]. On the other hand, the modern health system provided by the Government of Indonesia, including public health centers (PHCs, *Puskesmas*) or supporting PHC (*Pustu*), has also existed in Tengger communities. Little is known about the current treatment preference of the Tenggerese toward modern versus traditional medicine, and therefore, it would be an interesting and helpful subject of investigation that could help inform future public health development. While it is impossible to take most diseases into account, diarrhea is a good starting point to study this treatment preference

pattern, as the ailment is a common condition that occurs across age groups and geographical areas [14]. Diarrhea in many research studies may not only be defined quantitatively as the passage of three or more loose or watery stools in a 24 h period, but also qualitatively, as the caregiver's or someone's perception or report of diarrhea, and visual inspection of the stool [15, 16]. By duration, this disease can be classified as acute diarrhea lasting less than four weeks, and chronic diarrhea that lasts longer than four weeks. Other examples include persistent diarrhea that occurs within 2–4 weeks. Acute diarrhea is more likely to be caused by infection, while chronic diarrhea is less likely to be infectious and can be attributed to other possible causes [16]. Infections that cause diarrhea can be transmitted via the fecal-oral route [17].

One of the reasons to select diarrhea for this study was that it remains among the top ten causes of death among under-five children in Indonesia in 2015 [12]. Moreover, diarrhea can be perceived as a non-life-threatening, minor condition, but can also be fatal, which may affect the treatment preference [18, 19]. This research aimed to explore the treatment preferences of the Tenggerese for diarrheal cases and their associated sociodemographic factors.

Materials and methods
Study design
An analytical cross-sectional design was used in this study. The data from each respondent were collected once during a specified period. Sociodemographic factors were analyzed to ensure they were correlated with the treatment preferences.

Study location
This survey was undertaken in the Tosari District, Pasuruan Regency, East Java Province, Indonesia. Tosari is situated in the North West of the Tengger Caldera where Mount Bromo is located. This study was performed in all eight villages in Tosari District, namely, Kandangan, Mororejo, Ngadiwono, Podokoyo, Wonokitri, Tosari, Baledono and Sedaeng.

Ethical consideration
All procedures were conducted following the 1964 Helsinki Declaration and its later amendments. Informed consent was obtained from all individual participants included in the study. Permission to conduct the research was sought from the *Bakesbangpol* office in Pasuruan Regency, East Java Province (No. 072/492/424.104/SUR/RES/2017).

Sample size and sampling method
The sample size was defined using a formula based on a given population developed by Krejcie and Morgan [20]. The latest estimate of the Tosari population in 2010 by the Pasuruan Statistics Bureau was 18,842. Based on that figure, the chi-square table value of 3.841 for 95% confidence level, the population proportion of 0.5, and the degree of accuracy of 0.5, the required sample size was 377. A convenience sampling method was used to recruit respondents as most Tenggerese worked in the non-office-based sectors, and so, their presence at home during the day was not predictable.

Inclusion and exclusion criteria
Data collection used a face-to-face visit and was conducted during October–December 2017. Only Tenggerese people were asked to participate after agreeing to the informed consent. A respondent was considered as a Tenggerese if they answered "Yes" to the question "Are you a Tenggerese?" and if their grandparents from both parent's sides were Tenggerese. Other

inclusion criteria were based on their history of an episode of diarrhea and if they still remembered the medication they used, as well as their age that was limited to more than or equal to 20 years old. Data from Tosari PHC (*Puskesmas*) in 2016 showed that most diarrhea presentations were from this age group. Respondents were excluded if they did not fill the second part of the questionnaire completely according to the flow so that it could not be concluded if they chose modern medicine, traditional medicine or both.

Data collection instrument and process

A structured questionnaire with two sections was developed. The first section contained nine questions related to the respondent's identity, including name, age, religion, sex, self-assessed distance to the nearest PHC, completed educational level, job, self-assessed ethnic group and grandparents' ethnicity. The second section comprised ten questions related to diarrhea. Of them, nine questions and their answers were adopted with permission from the Woman Questionnaire of Demographic and Health Survey (DHS) 2017 (dhsprogram.com). These nine questions in the DHS Woman Questionnaire were intended to gather data about diarrhea in children under five in English. Therefore, they were adjusted and translated into Bahasa Indonesia for the purpose of this study. The second section of the questionnaire indicated the treatment preference of the respondent, which was the dependent variable in this study, i.e. modern medicine, traditional medicine or mixed approach. Face validity of the questionnaire was tested on 20 Tenggerese. The respondents were asked to read the instructions, questions and close-ended answers on the questionnaire. The flow of questions was also evaluated. They were requested to ask for assistance if questions or process was unclear. No significant modification was suggested by the respondents of the face validity test other than the suggestion of detailing the definition of diarrhea at the beginning of the questionnaire, which was applied. Data during the actual survey were collected by two trained surveyors involved in the research process. The training provided materials about the comprehension of the instructions, questions, answers and the flow of the questionnaire. The training also prepared the surveyors with some methods to approach prospective respondents without ignoring the cultural norms to identify their eligibility, to briefly explain the study, to gain agreement by signing the informed consent form, to identify a convenient space to fill in the questionnaire, to assign respondent codes for each questionnaire, to store the filled in questionnaires and to record the data on a pre-formatted MS Excel sheet.

Statistical analyses

Data were recorded in Microsoft Excel spreadsheet format and then analyzed using Stata 13 (Stata Corp., College Station, Texas, USA). Categorical data were presented descriptively as a percentage. Chi-square, or Fisher's exact as an alternative, was used to determine the association between each sociodemographic variable and the types of treatment preference. A p-value of < 0.05 was considered statistically significant.

Results

A total of 431 respondents were approached, and 54 (12.5%) of them were excluded because they did not identify themselves as Tenggerese (8%, $n = 36$) and were under 20 years old (4%, $n = 18$), giving a response rate of 87.5%. Although other ethnic groups such as Javanese and Madurese also lived in the area of study, only the Tenggerese group was included. Just more than half of the respondents (52%, $n = 196$) preferred modern health care and only 15.9% ($n = 60$) used traditional medicines (Table 1). About 54% ($n = 206$) respondents were female, and 57% ($n = 215$) respondents were in the 20–44 years old age group. Almost two-third (65.8%, $n = 248$) of the respondents practiced Hinduism. Most respondents

Characteristic	Frequency, $n = 377$ (%)
Age (years)	
20–44	215 (57)
45–59	120 (31.8)
≥60	42 (11.14)
Religion	
Hindu	248 (65.8)
Muslim	120 (31.8)
Christian	9 (2.4)
Gender	
Male	171 (45.4)
Female	206 (54.6)
Self-estimated distance to a modern health facility	
≤ 2 km	81 (21.5)
3–5 km	238 (63.1)
≥ 6 km	58 (15.4)
Education attainment	
Elementary school (SD)	114 (30.2)
Junior high school (SMP)	125 (33.2)
Senior high school (SMA)	102 (27)
Diploma	4 (1.1)
Undergraduate	32 (8.5)
Employment	
Public servant	18 (4.8)
Farmer	178 (47.2)
Retailer	26 (6.9)
Entrepreneur	71 (18.8)
Housewife or undergraduate student	78 (20.7)
Other	6 (1.6)
Village	
Kandangan	46 (12.2)
Mororejo	26 (6.9)
Ngadiwono	55 (14.6)
Podokoyo	37 (9.8)
Wononitri	59 (15.6)
Tosari	64 (17.0)
Baledono	38 (10.1)
Sedaeng	52 (13.8)

Table 1.
Characteristics of
respondents

(63.1%, $n = 238$) lived approximately 3–5 km from the nearest health-care facility. Around a third of respondents (33%, $n = 125$) graduated from junior high school (Year 9, SMP), while the remaining were graduates of either elementary school (Year 6, SD) (30%, $n = 114$) or senior high school (Year 12, SMA) (27%, $n = 102$). Almost half of the respondents (47.2%, $n = 128$) were farmers.

Comparison between villages (Supplementary Information A) revealed that across all villages, the dominant respondents were from the youngest age (20–44 years), practiced Hinduism, with exceptions in Tosari and Baledono, where they were mostly Muslim, lived approximately 3–5 km from a modern health-care facility, with exceptions in Tosari and Baledono, and worked in the agricultural sector with an exception in Tosari. In terms of sex, respondents from the five villages Kandangan, Podokoyo, Wonokitri, Tosari and Baledono

were mostly female. In terms of education, most respondents had completed junior high school, except those who were from Kandangan and Tosari (senior high school) and from Mororejo, Ngadiwono and Baledono (elementary school).

Regarding their experience, while having an episode of diarrhea, most respondents (64.3%, $n = 242$) only visited one treatment facility or stayed at home, while the other 34.7% ($n = 131$) visited two or more facilities (Table 2). *Puskesmas* was mostly visited by those who only attended one facility. Among those who went to more than one facility, the most commonly visited treatment facility was a general store. *Oralit*, the local name for oral rehydration solution, was predominantly known (92%, $n = 347$), and about 86.7% ($n = 327$) confirmed their use of *oralit* while having diarrhea. Respondents who chose traditional medications over the modern approach used table salt ($n = 66$, 48.9%), jasmine tea without sugar ($n = 39$, 28.9%) and a local plant called *jambu wer* ($n = 15$, 11%) (Table 3).

Chi-square tests showed statistically significant relationships between treatment choice and age ($p < 0.001$), sex ($p < 0.001$), religion ($p = 0.011$), distance ($p < 0.001$), educational background ($p < 0.001$), job ($p < 0.001$) and villages ($p < 0.001$) (Table 4). Of eight villages, six were reported to choose more modern medicines, while two others chose a mixed approach. It is worth noting the relationship pattern between treatment choice and age. Younger

Facility of choice	Frequency, $n = 377$
Visiting one facility or using home remedies (n = 243)	
Puskesmas	127 (33.7)
Traditional healer (dukun)	51 (13.5)
Midwife	47 (12.5)
Nurse	7 (1.9)
Retail shop	6 (1.5)
Home remedies	5 (1.4)
Visiting two or more facilities (n = 134)	
Puskesmas + retail shop	44 (11.7)
Puskesmas + home remedies	35 (9.3)
Midwife + retail shop	19 (5.0)
Midwife + traditional healer	9 (2.4)
Puskesmas + traditional healer	8 (2.1)
Midwife + home remedies	6 (1.6)
Traditional healer + retail shop	3 (0.8)
Nurse + retail shop	3 (0.8)
Puskesmas + midwife	2 (0.5)
Nurse + home remedies	2 (0.5)
Home remedies + retail shop	2 (0.5)
Nurse + traditional healers	1 (0.3)

Table 2.
Visit to a facility to seek treatment for diarrhea among Tengger people

Remedy	Users, $n = 135$ (%)
Salt	66 (48.9)
Tea without sugar	39 (28.9)
Jambu wer	15 (11.1)
Guava leaves	10 (7.4)
Grunggung	3 (2.2)
Jamu gendong	2 (1.5)

Table 3.
Traditional antidiarrheal medications of Tengger people

Characteristic	Modern medicine, $n = 196$ (%)	Frequency, $n = 377$ Traditional medicine, $n = 60$ (%)	Mixed approach, $n = 121$ (%)	p-value
Age (years)				
20–44	184 (85.6)	2 (0.9)	29 (13.5)	<0.001
45–59	12 (10)	21 (17.5)	87 (72.5)	
≥60	0 (0)	37 (88.1)	5 (11.9)	
Religion				
Hindu	128 (51.6)	50 (39.5)	70 (28.2)	0.011
Muslim	62 (51.7)	10 (8.3)	48 (40)	
Christian	6 (66.7)	0 (0)	3 (33.3)	
Gender				
Male	74 (43.3)	42 (24.6)	55 (32.2)	<0.001
Female	206 (54.6)	18 (8.7)	66 (32)	
Self-estimated distance to a modern health facility				
≤ 2 km	47 (58)	5 (6.2)	29 (35.8)	<0.001
3–5 km	133 (55.9)	33 (13.9)	72 (30.3)	
≥ 6 km	16 (27.6)	22 (37.9)	20 (34.5)	
Education attainment				
Elementary school (SD)	26 (22.8)	42 (36.8)	46 (40.4)	<0.001
Junior high school (SMP)	64 (51.2)	16 (12.8)	45 (36)	
Senior high school (SMA)	80 (78.4)	2 (2)	20 (19.6)	
Diploma	1 (25)	0 (0)	3 (75)	
Undergraduate	25 (78.1)	0 (0)	7 (21.9)	
Employment				
Public servants	12 (66.7)	0 (0)	6 (33.3)	<0.001
Farmers	67 (37.6)	42 (23.6)	69 (38.8)	
Retailer	20 (76.9)	1 (3.8)	5 (19.2)	
Entrepreneur	40 (56.3)	5 (7)	26 (36.6)	
Housewife or undergraduate students	55 (70.5)	12 (15.4)	11 (14.1)	
Others	2 (33.3)	0 (0)	4 (66.7)	
Village				
Kandangan	36 (78.2)	5 (10.9)	5 (10.9)	<0.001
Mororejo	12 (46.2)	7 (26.9)	7 (26.9)	
Ngadiwono	33 (60.0)	6 (10.9)	16 (29.1)	
Podokoyo	20 (54.1)	3 (8.1)	14 (37.8)	
Wononitri	30 (50.9)	12 (20.3)	17 (28.8)	
Tosari	34 (53.1)	5 (7.8)	25 (39.2)	
Baledono	14 (36.8)	5 (13.2)	19 (50)	
Sedaeng	17 (32.7)	17 (32.7)	18 (34.6)	

Table 4.
Relationships between sociodemographic characteristics and treatment preference

participants of 20–44 years old tended to choose modern medicines, older group > 60 years old preferred traditional medications and the age group in between chose a mixed approach.

Discussion

To the best of our knowledge, this is the first research exercise to explore the choice of treatment means in the case of diarrhea among the Tengger ethnic group. The high response rate from this research may be because of two factors: the survey was face-to-face and the Tenggerese has long been documented as an open and peaceful society [21]. One may think

that the preference for seclusion and privacy among the Tenggerese may prevent this group from using modern medicine. This study, however, proves otherwise and supports the earlier argument that the young Tenggerese tend to choose modern medications [11, 13].

A clear difference in treatment preference existed between age groups. This result was not in line with two previous Indonesian studies conducted in two areas among the Mentawai and Dayak Tanjung ethnic groups [22, 23]. Both of those ethnic groups relied on traditional health systems more than the Tengger people who are more influenced by tourism and the increased number of local health-care facilities. Tourism may have socio-cultural impacts on local people through modernization and development [24]. The Tenggerese live surrounding the Bromo Mountain, which is one of the famous tourist destinations in Indonesia for both local and international travelers [10]. Tosari itself is one of several gateways to Bromo [12]. The Bromo tourism spot has recently been declared by the Indonesian government as one of ten new superior tourism destinations [25]. While Mentawai and Dayak Tanjung are also tourism spots, they are not as popular as the Bromo Mountain. Furthermore, even though it is still limited in number and quality, modern health care in Tosari has been more accessible than in previous years. The Tosari *Puskesmas* now supervises three supporting health centers (*Puskesmas pembantu*, *Pustu*) and four village maternity posts (*pondok bersalin desa*, *Polindes*). These health facilities have some top-down routine programs, such as a monthly maternal and child health service programs (*Posyandu*) that can reach wider communities. Our study showed that more than a third of respondents employed the services provided by *Puskesmas* when they had diarrhea. This may provide a clue that increasingly more Tenggerese rely on modern health services.

The correlation between age groups and the treatment preference could partially be explained by the history of formal health services and participation in formal education. The *Puskesmas* of Tosari was established in 1979. During that time, our participants aged more than 60 years were still in their early or late 20s or 30s. Most of them did not attain any formal education and were from a generation that mostly relied on traditional medicine. The roles of traditional health practitioners as well as herbal medicines were pivotal for them. The introduction of the modern health service, i.e. *Puskesmas*, would not easily replace their belief in traditional practices. Meanwhile, the younger participants of our study know more about the functions of *Puskesmas* as they mostly achieved formal education where they would have been introduced to the essential functions of modern health services. Therefore, to some extent, they may have more trust in the modern health service compared to their elders. Moreover, although there are no official records, the number of traditional health practitioners in Tengger is possibly shrinking as is their frequency of practice. This reduced number of traditional practitioners was also reported by a national survey on knowledge of ethnomedicine and community-based herbal medicines in 2015 in Indonesia [26].

Further research is required to provide clear reasons behind the preference of each individual respondent regarding the age difference. Gyamfuah *et al.* [27] conducted a similar study in Ghana and found the reasons for the elders' surveyed preferred traditional medicine over modern, or "orthodox" medicine. Ghanaian elders who opted for traditional medicine mostly perceived that the traditional method was more effective than the orthodox method. Another reason is that they also thought that the side effects of traditional medicine are minimum [27]. Indeed, this perceived efficacy and safety are also explained as reasons why people choose traditional medicine by Falkenberg [28]. Other reasons are easy accessibility and affordability. However, it is unknown if these reasons might apply to the elders of Tengger and requires further research.

This shift of treatment preference should be used as valuable information for policymakers. First, this study demonstrated that the preservation of knowledge on traditional health practice among the Tenggerese is a real need. The Indonesian government

via the Ministry of Health had conducted three waves of a national survey on herbal medicines and *jamu* (Ristoja) in 2012, 2015 and 2017 to preserve the traditional health practice in Indonesia, including Tengger. In every site, the survey was only performed over a short span of time, about two weeks, to gather information from five local traditional health practitioners [26]. This method had its limitation, as it was unable to comprehensively document the knowledge of traditional healers. Second, the use of a mixed-approach method to treat a disease may not always be safe because adverse interactions may occur [29]. This suggests the need for screening patients for the use of traditional medicines before their presentation to health service. If beneficial, they can be used together. Third, the policymakers should provide more support to the service of health facilities in Tengger, as more Tenggerese prefer this service. The support can be in the form of providing additional health professionals or improving their capacities, adding the number of health facilities and promoting health service through schools.

It is necessary to note from our study that although oral rehydration solution is prevalent among the Tenggerese, several respondents who opted for traditional medicines admitted using table salt to treat their episodes of diarrhea. The table salt used for remedial purposes is unique, as it was provided by a traditional healer or *dukun*, who it was believed put a spell on it. This survey, however, did not question the quantity or dose regimen for this table salt treatment, the duration of use and whether it needed to be diluted in a glass of water before it was taken. Indeed, oral rehydration solutions have been proven to save millions of lives as long as it is prepared correctly [30]. However, this practice of using only salt solution without sugar and correct measurement of each ingredient could be dangerous, especially for children, as it may lead to hypo- or hypernatremia [31, 32]. Moreover, a high number of self-admitted *oralit* users could overlap treatment by consumption of the salt only solution. The Tenggerese might misidentify this salt only solution as *oralit*, and therefore, health education in this area may be necessary.

Among those who preferred the traditional health system, sugarless jasmine tea (black tea) and *jambu wer* were the two most cited treatments. Sugarless jasmine tea is famous among the Javanese and other ethnic groups in Indonesia for diarrhea treatment, especially in children [33, 34]. *Jambu wer*, on the other hand, seems to be regarded as specific to the Tenggerese for diarrhea treatment. Several previous studies reported the use of this plant on diarrhea treatment among the Tenggerese. Unfortunately, the scientific name of this plant varies from one report to the other. Aziz [35] reported *jambu wer* as *Pimento dionica*, Batoro *et al.* [12] determined it as *Prunus persica*, while Bhagawan [36] and Pamungkas [37] reported the same local name of the plant as *Elaeocarpus longifolius* Blume. Further information gathered from theplantlist.org, which has big database on the accepted Latin name of plants and their synonyms, showed that the three names are different from each other. *Pimento dionica* cannot be found in The Plant List database (www.theplantlist.org), thus may be a typo of *Pimenta dionica* (L.) Merr. that belongs to the Myrtaceae family. *Prunus persica* belongs to Rosaceae, while *Elaeocarpus longifolius* is from Elaeocarpaceae. Tannin-rich medication was commonly used in diarrhea treatment in which our literature studies suggested the two previously mentioned species might constitute the typical tannin. However, further studies are necessary to reveal the potency.

Conclusion

This study showed that the majority of Tenggerese in the Tosari District preferred modern medicines for the treatment of diarrhea. This case may represent other uncomplicated, easily self-diagnosed and common health problems occurring among Tenggerese. The shift in treatment preference was apparent. While the elders of Tengger maintained the practice of traditional medicine, the young Tenggerese tended to seek modern medicine. Further study is

needed to find the reasons behind this shift and better support its efficacy among this ethnic group.

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