RESEARCH ARTICLE

Health literacy strengths and limitations among rural fishing communities in Egypt using the Health Literacy Questionnaire (HLQ)

Wagida A. Anwar[1], Nayera S. Mostafa[1]*, Sally Adel Hakim[1], Dalia G. Sos[1], Dena A. Abozaid[1], Richard H. Osborne[2]

1 Department of Community, Environmental and Occupational Medicine, Faculty of Medicine, Ain Shams University, Cairo, Egypt, 2 Centre for Global Health and Equity, Faculty of Health, Design and Arts, Swinburne University of Technology, Melbourne, Australia

* nayera_samy@med.asu.edu.eg

Abstract

Introduction

Health literacy is an important determinant of health. The aim of this study was to use a multi-dimensional measurement tool to describe the health literacy of people living in a fishing community in northern Egypt.

Methods and analysis

Data were collected from 436 people (fisherman and their families), using the Health Literacy Questionnaire (HLQ), which includes 9 scales. Effect sizes (ES) for standardized mean differences estimated the magnitude of difference between demographic groups.

Results

The mean age of participants was 42 years, 50% were male, 42% were working in the fishing sector, 17.9% had access to the Internet and 36.8% were illiterate. Male participants showed higher capabilities in scales 3. *Actively managing my health* and 4. *Social support for health* (ES = 0.21 and 0.27, respectively). In comparison to other occupations, fishing occupation had a negative impact on scale 7. *Navigating the healthcare system* (ES -0.23). Also, higher educational level was associated with higher HLQ indicators. Across all scales, scale 2. *Having sufficient information to manage my health* showed the lowest mean (SD) score; 2.23 (0.76) indicating that most people reported they didn't have enough information.

Conclusions

This study has revealed that fishermen and their families have a wide range of health literacy difficulties which are likely to have profound negative effects on health behavior and health outcomes.

Introduction

Health literacy is defined as a person's ability to access, understand, appraise, remember/
retrieve, and use information about health and health services [1]. It is a concept that is
broader than health education because health literacy addresses environmental, political and
social factors that influence an individual's ability to engage with health information and
health services. Health literacy is influenced by the strengths and limitations of individuals and
of communities. Some of them are related to the level of education of the population and stan-
dard of healthcare services [1]. In order to improve health inequities in a community, the
diversity of health literacy strengths and limitations of individuals must be assessed, and inter-
ventions designed and delivered to address this diversity [2]. Furthermore, for an organization
or health service to be health literacy responsive, it needs to understand the health literacy
strengths and limitations of the people in that community, and to facilitate access to health
information and services to all people, regardless of their health literacy limitations [2,3].

There is limited research on health literacy in Arab countries. A study conducted in Saudi
Arabia using a word recognition test found that 57.4% of Saudi Arabians had difficulty recog-
nizing health-related words [4]. In Egypt, a study explored health-related reading and numer-
acy (i.e., functional health literacy) among elderly caregivers in the Geriatrics Medicine
Department of Ain Shams University (ASU) Hospitals. Findings indicated about 75% of the
participants were classified as having limited functional health literacy. Another study showed
that lower functional health literacy was associated with higher frequency of hospitalization,
longer hospital stays, and lower health-related quality of life [5]. A study among people attend-
ing outpatient clinics at Ain Shams University Hospitals found that half of the participants did
not have enough reading, writing and information processing abilities to effectively participate
in their own care [6].

While HL is a challenge for people attending healthcare services in cities (like capitals and
developed areas), people working in hazardous labor industries in rural regions potentially
have greater personal health challenges, particularly given limited access to high quality health-
care services. One of the oldest rural occupations is fishing [7]. Fishermen are exposed to cold,
wind, rough seas, hard physical labor, and they frequently sustain injuries during their work
[8]. The International Labour Organization stated that in developing countries, many commu-
nities, such as fishing communities, are in remote areas with poor living conditions. Generally,
people working in small-scale fishing enterprises are exposed to risks such as bad weather,
onboard fire hazards, inadequate boat construction standards, loss of power, lack of accessible
shelters, and isolation through inadequate radio communication facilities [9].

Alongside the hazards of the fishing occupation, fishermen are at high risk for chronic dis-
eases due to an unhealthy lifestyle. A Danish study indicated that fishermen were at increased
risk of hospitalization for lifestyle-related diseases such as diabetes, heart diseases, bronchitis,
emphysema, cancer of the lung, alcohol-related liver diseases, and Raynaud's syndrome [10].
Other studies showed that fishing is an occupation with high incidence of musculoskeletal dis-
orders and injuries, and even increased risk of fatalities [11–13].

Globally, fishing communities are highly disadvantaged because they tend to be denied a
range of healthcare services [14]. In Egypt, a study found that fishermen in Alexandria were at
excessively high risk of musculoskeletal disorders, auditory complaints, sunburn and injuries.
It was found that fishermen tended to spend long hours working at sea and were suffering
from psychological stress, job instability, and were infrequent users of personal protection
equipment [15]. A study in Bangladesh reported that the fishermen were a disadvantaged and
neglected group [16]. Disadvantaged populations are defined as *"those persons who, for a num-
ber of reasons, see their capacity to take advantage of opportunities diminished in comparison*

with other groups." [17]. These populations are characterized by their inability to participate fully in social and economic activities, as well as their low decision-making ability, high social exclusion, and reduced access to essential goods and services such as health care [18].

There is a need for health promotion and education initiatives to raise awareness in fishing communities about health promotion and the management of chronic diseases [19]. This study could play a role in the required health promotion, as it aimed to describe the health literacy of a community of fishermen and their families living around Borollos Lake in Egypt. Borollos Lake is located in Kafr El Sheikh, one of Delta region's governorates, has a large group of inhabitants working as fishermen. Multi-dimensional Health Literacy Questionnaire (HLQ) [20] was used to gain an in-depth understanding of the health literacy strengths and limitations of community members to guide potential development of local and regional interventions.

Methods

Study design

The study is part of a larger project taking place in the rural Borollos Lake region that aims to develop a comprehensive and holistic description of the fishing community, their health problems, and the current health and environmental risk factors. This health literacy study uses the OPtimising HEalth LIteracy and Access (Ophelia) process to intervention co-design and implementation [21]. This paper documents the quantitative data collection for the first of the three phases of the Ophelia process. The first phase involves a cross-sectional survey to describe the health literacy profile of the Borollos Lake fishing community, which is a fundamental needs assessment activity.

Setting and participants

Borollos Lake is surrounded by 5 sub-regions. The majority of their inhabitants work in fishing. The sample of the study comprised fishermen and their families, who were recruited from five villages representing the five sub-regions around Borollos Lake. One village from each sub-region was selected based on the perceptions of community leaders regarding their need for community health promotion interventions. Participant selection criteria were deliberately unrestrictive but required that participants be over 18 years of age and be able to provide written informed consent following the provision of an explanation of the project's rationale and procedures. With the aid of the non-governmental organizations and fishermen syndicates, announcements were done before the research team arrived to the village to arrange for the meetings with the fishermen and their families at one of the non-governmental organizations settings. Although the study procedure used convenience sampling, all fishermen and their families that were were invited to participate in the study did participate. Recruitment of participants took place in the period from January–May 2018.

Data collection

Participants were interviewed by a health worker or research assistant. The HLQ was administered verbally. Socio-demographic data collected included age, sex, living alone or with others, Internet usage, family income, occupation (fisherman or other), educational attainment (illiterate, primary level or above primary level).

The HLQ consists of nine scales each with between 4 and 6 items. The nine scales are mentioned in Table 1.

Table 1. HLQ scales.

1.	Feeling understood and supported by healthcare providers
2.	Having sufficient information to manage my health
3.	Actively managing my health
4.	Social support for health
5.	Appraisal of health information
6.	Ability to actively engage with healthcare providers
7.	Navigating the healthcare system
8.	Ability to find good health information
9.	Understand health information well enough to know what to do

https://doi.org/10.1371/journal.pone.0235550.t001

The HLQ has been widely used, and validity testing of the English HLQ has been under-taken in several communities [22,23] and translated into more than 30 languages. The HLQ was specifically developed and for surveys and intervention evaluation as well as for exploring the health literacy needs of individuals and communities [20,24]. Validity testing of translated versions has been undertaken in several countries and these studies have contributed to the network of evidence for valid decisions using HLQ data in these cultural contexts [25–29]. A license to use the previously-developed Arabic version of the HLQ was obtained. As formerly mentioned, the HLQ was validated and translated to many languages including Arabic. The Egyptian team undertook qualitative work in the form of local Egyptian Arabic linguistic and cultural adaptation to ensure all items were culturally appropriate and matched the original English HLQ item intent descriptions in the Translation Integrity Protocol [30,31]. The adap-tation process included consensus meetings to ensure concepts and language elements were appropriate for the population and the item meaning, as closely as was possible, matched the original items. We found that all of the HLQ scales were relevant and easily understood in our context. A pre-study test was conducted with 12 participants from the Borollos Lake region. To improve readability only five changes were made to the questionnaire. Two specific Egyp-tian Arabic words were substituted for Arabic words that were less familiar to this population, whereas the other changes related to choice of a less complex word, replacement of an ido-metic expression with a literal expression and one word that was a better respresentation of the strength of an English expression [31]. For example, "healthcare provider" was changed to a rendition of "any professional who help take care of your health (for example doctor, nurse,.)" to maximise understanding. Also, "choose the healthcare provider you should see" was changed to "decide the specialty that suits your complaint" because the literation more closely matched the English intent.

The items in the first five HLQ scales have four response options scored 1 to 4: strongly dis-agree (1), disagree (2), agree (3) and strongly agree (4). Scales 6–9 have five response options (scored 1–5) Cannot do or usually difficult (1), very difficult (2), quite difficult (3), easy (4), and very easy (5). A scale score is devised by summing the item scores within each scale and dividing by the number of items in the scale, hence a scale score of 3 on the difficulty scale indicates and individual rated most items as quite difficulty. All scales have composite reliabil-ity from 0.8 to 0.9 [13] and the 8-scale factor structure and other strong psychometric prop-eries have been confirmed in several languages [31].

Statistical analysis

HLQ scales and socio-demographic data were analyzed using SPSS Version 21. Descriptive statistics described socio-demographic data. For all HLQ scales, responses covered the full

range of the scales with modest or no floor effects but assumptions of normal distribution were not met. Scales 1 and 6–9 also violated homogeneity of variances. Hence robust analysis of variance (ANOVA) using the Welch method was used. Where required, post hoc testing was undertaken using the Games-Howell method of multiple mean comparisons. Effect sizes (ES) for standardized differences in means between demographic groups were calculated using Cohen's d (calculated as the difference between the two means, divided by the pooled standard deviation (SD) of both means). The ES is interpreted as follows: 'small' ES >0.20–0.50, 'medium' ES 0.50–0.80, and 'large' ES >0.80 [32]. As was an exporatory, the first in Egypt with the HLQ and non-population-based study, no *a priori* sample size calculation was undertaken. Whenever suitable, 95% confidence intervals were calculated. A p-value of <0.05 was assumed for statistical significance.

Results

A total of 436 participants were recruited from 5 villages (61 to 103 per village). The mean (SD) age of participants was 42 (15) years, range 18 to 89, with 65.2% of participants aged under 50 years (44% were in the middle-aged group (20–40 years)). Males comprised 50% of the sample, 37.1% were illiterate, and 42.4% were working actively as fishermen (see Table 2).

As shown in Table 3, 78% of the fishermen worked on fishing boats far off shore. Exposure to extreme temperature as well as to noise and humidity were common occupational exposures.

For HLQ scales 1–5 (see Table 1) (range 1 to 4), the highest mean (SD) score was seen for *4. Social support for health* (mean 2.9 (0.69)). Given how the items/scales are rated (1. strongly disagree to 4. strongly agree), this score indicated that most people agreed that they had social

Table 2. Socio-demographic characteristics for overall sample (fisherman and their families).

	n	%
*Age**		
< 50 yrs	285	(65.3)
≥ 50 yrs	151	(34.7)
Sex		
Male	216	(49.5)
Female	220	(50.5)
Education		
Illiterate	162	(37.1)
Primary level only	151	(34.6)
Higher than primary (N.B: only 16 of them finished university degree)	123	(28.3)
Occupation		
Fishermen	185	(42.4)
Housewives	184	(42.2)
Other (employees, skilled workers and students)	67	(15.3)
*Income***		
≤ 2000L.E/month	385	(88.3)
>2000L.E/month	51	(11.7)
Internet usage		
Use Internet(at least once daily, weekly, monthly)	78	(17.9)
Never/rarely	358	(82.1)

*50 years is the median age of the study participants.

**2000 L.E. is equivalent to USD110 in 10 January 2019. It is the median of the income of the study participants.

Table 3. Occupational characteristics of fishermen included in the study (n = 185).

	n	%
Exposure to occupational hazards		
Noise	103	(55.7)
Extreme temperature	146	(78.9)
Awkward body postures	82	(44.3)
Accidents and injuries	51	(27.5)
Shift work (day / night)	99	(53.5)
Duration of fishing career (years)		
Median (IQR*) = 30 (25)		
Work location:		
Far off shore	145	(78.3)
Near lake shores	40	(21.7)

*IQR: Interquartile Range

support. The lowest score was for *2. Having sufficient information to manage my health* (mean 2.2 (0.76)), followed by scales 3. and 5. that covered managing health and critical appraisal (2.37 for both) indicating that most people disagreed that they had sufficient information, could manage or appraise health information. For the last 4 scales (1. cannot do to 5. very easy), the highest score was for *6. Ability to actively engage with healthcare providers* (mean 3.5 (0.96)), indicating that most people scored between 2 and 3. The lowest score was for *8. Ability to find good health information* (mean 2.7 (1.1)) where most people scored from difficult to very difficult (see Table 4).

Table 5 shows patterns of HLQ scores according to socio-demographic status. Differences (expressed as ES) provide an indication of the magnitude of differences. Differences were observed between age groups where those younger than 50 years reported slightly higher scores than those older than 50 years for *2. Have sufficient information to manage my health (ES -0.19), 5. Appraisal of health information (ES-0.22), 8. Ability to find good health Information(ES-0.31) and 9. Understand health information well enough to know what to do* (ES -0.27).

Table 4. Health Literacy Questionnaire (HLQ) scores for overall sample (fisherman and their families).

HLQ Scale	Mean (SD) [95% CI]
	Range 1 (lowest) 4 (highest)*
1. Feeling understood and supported by healthcare providers	2.51 (0.83) [2.43–2.58]
2. Having sufficient information to manage my health	2.23 (0.76) [2.16–2.30]
3. Actively managing my health	2.37 (0.75) [2.30–2,44]
4. Social support for health	2.95 (0.69) [2.89–3.03]
5. Appraisal of health information	2.37 (0.79) [2.29–2.44]
	Range 1 (lowest) 5 (highest)**
6. Ability to actively engage with healthcare professionals	3.50 (0.96) [3.41–3.59]
7. Navigating the healthcare system	3.11 (1.03) [3.01–3.21]
8. Ability to find good health information	2.78 (1.10) [2.67–2.88]
9. Understand health information well enough to know what to do	3.26 (0.88) [3.18–3.35]

Abbreviations = SD Standard Deviation, CI Confidence Interval

* 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree

** 1 = Cannot do or usually difficult, 2 = very difficult, 3 = quite difficult, 4 = easy, and 5 = very easy

Table 5. Association between HLQ scores and socio-demographic characteristics.

		1. Feeling understood and supported by health care providers	2. Having sufficient information to manage my health	3. Actively managing my health	4. Social support for health	5. Appraisal of health information	6. Ability to actively engage with health care providers	7. Navigating the healthcare system	8. Ability to find good health information	9. Understand health information well enough to know what to do
Mean score(SD)										
Age	<50yrs	2.54(0.77)	**2.29(0.72)**	2.40(0.68)	2.96(0.72)	**2.43(0.76)**	3.49(0.88)	3.15(0.93)	**2.90(1.04)**	**3.35(0.85)**
	≥50yrs	2.43(0.94)	**2.14(0.81)**	2.34(0.86)	2.96(0.64)	**2.25(0.83)**	3.53(1.08)	3.04(1.21)	**2.57(1.17)**	**3.11(0.92)**
	Difference	Put result here	**0.15**	Put result here	Put result here	**0.18**	Put result here	Put result here	**0.33**	**0.34**
	ES*	Put result here	**0.19**	Put result here	Put result here	**0.22**	Put result here	Put result here	**0.31**	**0.27**
Sex	Male	2.48(0.88)	2.23(0.81)	**2.45(0.78)**	**3.05(0.70)**	2.33(0.85)	3.45(0.97)	3.06(1.13)	2.76(1.19)	2.28(0.87)
	Female	2.53(0.78)	2.23(0.70)	**2.29(0.72)**	**2.86(0.68)**	2.40(0.73)	3.56(0.94)	3.16(0.93)	2.79(1.00)	3.25(0.90)
	Difference	etc								
	ES*		**0.21**	**0.27**						
Occupation	Fishermen	2.49(0.92)	2.17(0.81)	2.42(0.77)	3.0(0.74)	2.3(0.85)	3.42(0.91)	**2.97(1.14)**	2.66(1.1)	3.22(0.83)
	Other	2.51(0.76)	2.28(0.71)	2.33(0.74)	2.9(0.65)	2.41(0.750	3.56(0.99)	**3.21(0.93)**	2.86(1.0)	3.3(0.92)
	Difference	etc						????		
	ES*							0.23		
Income	≤2000L.E/ month	**2.55(0.82)**	2.25(0.74)	2.34(0.72)	2.95(0.68)	2.39(0.76)	3.51(0.95)	3.14(1.01)	2.78(1.08)	3.25(0.87)
	>2000L.E/ month	**2.14(0.85)**	2.06(0.88)	2.57(0.95	2.98(0.76)	2.17(0.97)	3.43(0.99)	2.91(1.16)	2.76(1.25)	3.39(0.95)
	Difference	????								
	ES*	0.49								
Internet use	Use Internet	**2.97(0.87)**	**2.60(0.72)**	**2.62(0.74)**	**3.17(0.92)**	**2.93(0.64)**	**4.05(0.8)**	**3.60(0.73)**	**3.59(0.87)**	**4.07(0.61)**
	Never/ rarely	**2.40(0.79)**	**2.15(0.74)**	**2.31(0.75)**	**2.90(0.62)**	**2.24(0.77)**	**3.38(0.85)**	**3.00(1.06)**	**2.60 (1.07)**	**3.08(0.83)**
	Difference	**0.57**	**0.45**	**0.31**	**0.83**	**0.69**	**0.67**	**0.60**	**1.01**	**1.07**
	ES*	**0.70**	**0.60**	**0.41**	**0.54**	**0.92**	**0.79**	**0.62**	**0.95**	**1.34**
Education	Illiterate (1)	**2.26(0.88)**	**2.01(0.81)**	**2.33(0.82)**	2.94(0.53)	**2.12(0.85)**	**3.40(1.02)**	**2.79(1.04)**	**2.30(1.05)**	**2.82(0.63)**
	Primary level (2)	**2.61(0.79)**	**2.18(0.66)**	**2.25(0.70)**	2.86(0.76)	**2.32(0.71)**	**3.37(0.99)**	**3.11(1.0)**	**2.74(1.02)**	**3.26(0.96)**
	Higher than primary (3)	**2.69(0.73)**	**2.59(0.66)**	**2.57(0.68)**	3.00(0.77)	**2.75(0.67)**	**3.82(0.73)**	**3.53(0.79)**	**3.44(0.92)**	**3.86(0.72)**
	Difference (1 vs 2)	**0.35**	**0.17**	**0.08**	Put result here	**0.2**	**0.03**	**0.32**	**0.44**	**0.44**
	ES**	**0.42**	**0.23**	**0.1**	Put result here	**0.25**	**0.02**	**0.31**	**0.42**	**0.54**
	Difference (1 vs 3)	**0.43**	**0.59**	**0.24**	Put result here	**0.63**	**0.42**	**0.74**	**1.14**	**1.04**

(Continued)

Table 5. (Continued)

Mean score($D)		1. Feeling understood and supported by health care providers	2. Having sufficient information to manage my health	3.Actively managing my health	4.Social support for health	5.Appraisal of health information	6.Ability to actively engage with health care providers	7.Navigating the healthcare system	8.Ability to find good health information	9.Understand health information well enough to know what to do
	ES**	0.53	0.78	0.31	Put result here	0.82	0.47	0.80	1.15	1.53

Male participants reported slightly higher scores than women for two scales: *3. Actively managing my health* and *4. Social support for heath* (ES = 0.21 and 0.27, respectively). Fishing occupation was associated with a lower score for *7. Navigating healthcare system* (ES = 0.23) compared with other occupations.

Regarding associations between economic situation and the HLQ, only *1. Feel understood and supported by healthcare professionals* indicated that people with low income (below sample median <2000 L.E/month; USD110 on 10 January 2019), reported substantially better than those with a higher income (ES = 0.49).

Across all scales, particpants who used the Internet had higher scores (medium to larg ES) than those who don't or rarely use the Internet with *8. Ability of find good health information* (ES = 0.95) and *9. Understand health information well enough to know what to do* (ES = 1.34) showing the largest differences.

We also compared three different levels of education (illiterate, primary, above primary). Differences were found in all the HLQ scales except for scale *4. Social support for health*, which was not associated with education level. Across the remaining scales, the largest differences (ES>0.8) were seen for scales *7. Navigating the healthcare system*, *8. Ability to find good health information* and *9. Understand health information well enough to know what to do* (see Table 5)

Discussion

Through the application of a multi-dimensional health literacy questionnaire in a low resource fishing community in Egypt, the abilities of people to understand, access and use health information and health services were determined. Overall, this community had low to very low health literacy, particularly for having enough information, actively managing their health, being able to critically appraise health information, and being able to find good health information. Most participants had some strengths in the areas of social support for health and communicating with health professionals, which reflects a communal and communicative society (i.e., health literacy assets).

Some sub-groups in this Egyptian community reported substantial challenges. Older people had greater challenges with the material elements of health literacy: namely, finding, understanding and appraising health information. Only about one fifth of the respondents used the Internet, and if they did, they had much stronger health literacy on virtually all dimensions. This pattern was striking and indicated that those without access to the Internet were likely to be greatly disadvantaged with regard to accessing health services and effective use of them. Having access to the Internet is related to higher education and literacy, and this is reflected in the strong association between virtually all the HLQ scales and educational achievement. Over one third of the sample were illiterate and this group reported some of the lowest health literacy Unsurprisingly, women were slightly worse with regard to their social support for health

and management of their health, which may be due to their husbands being frequently away at work on the lake and being isolated. Most women in this community are engaged in home duties and raising children where it is likely that due to cultural practices, they have limited time to look after themselves and have restricted access to people to look after them when they need help to engage with health practitioners. Futhermore, given their low income and access to money, women tend to spend the money they have on their children rather than on themselves. Other than these differences, men and women had similar health literacy profiles.

In overall, when interpreting the HLQ scores in the fishing villages, most people scored at the 'disagree' end of the scales or in the 'difficult' to 'very difficult' range, including those with higher income or education. Only a small percentage of people with higher than primary education appeared to have a good range of health literacy skills.

While younger people in general are expected to have the capability to search the Internet and find information online [33,34], most people in this study did not engage in Internet searching, or they found it difficult or impossible. This reflects the context of fishing village life, which is a community with poor or no Internet connectivity, a characteristic other rural areas in Egypt [35,36]. Given that the reading ability of most people in this population was very low, even if good quality reading material and/or Internet facilities were available, it would be of limited use.

In our study, fishermen reported slightly lower ability to navigate health services than women. This may be explained by the fact that the fishermen (42% of the study population) face a tight time schedule because of the nature of their job [37]. They have to work long hours at sea and they face many occupational hazards including the physical and psychological strains of shift work and being away from their village. They may not have had opportunities to learn the locations of health services, and may potentially rely on other family members for care and support for their health [38].

Health literacy is a relatively new concept for Egypt, with no previous studies having been conducted using a multi-dimensional health literacy profile tool such as the HLQ. Validity testing of Arabic translation was performed. This type of validity testing is essential when using a health literacy measure developed in a different culture [24]. This is especially important because health literacy is a reflection of an individual's personal skills but also the complexity of the environment in which, they live, which determines how difficult it is to navigate and access the available health information and services [39]. The issue of the cultural appropriateness of the HLQ and understandability of the concepts was specifically examined in our pre-study work because is an important element of validity evidence for making assertions about what questionnaire data mean [24,40].

The HLQ provides information about potential areas of action and is the basis of the OPtimise HEalth LIteracy and Access (Ophelia) process. The HLQ provides information about potential areas of action and is the basis of the OPtimise HEalth LIteracy and Access (Ophelia) process. The Ophelia approach aimed at identification of health literacy issues specific to the studied community and the development and implementation of specific suitable solutions. Those solutions were directed at organisational, staff, and community member levels. [41]. WHO stated that The Shanghai Declaration of 2016 recognized health literacy as one of the important pillars for achieving the Sustainable Development Goal targets [42]. Interventions should be adopted by communities as well as organizations in orderto achieve improvement in health literacy.

Strengths and limitations

This the first study to use the widely used HLQ–a psychometrically-robust multi-dimensional measure of health literacy–in a poorly resourced rural community with a high proportion of

people who are illiterate. Data from the HLQ has identified several areas of low to very low health literacy which provide guidene on what can be addressed to improve health outcomes. The adapted Arabic HLQ and verbal administration by interviewers enabled members of this rural Egyptian community to record their health literacy needs and so pave the way to take action for more equitable health service resource allocation.

Importantly, our sampling strategy gave opportunity for a wide range of community members to participate, ensuring that even some of the most disadvantaged people in the fishing communities could take part. The HLQ can be administered orally, which means that people do not have to be able to read or write to register their health literacy capacities. This is an important advantage over some other health literacy measures which require respondants to read specific text [43,44]. While this study is not population based (a potential limitation), it does provide a comprehensive profile of the health literacy diversity in the Borollos Lake fishing community, a community that is typical of many communities in Egypt, which reflect communities in many countries in the region.

Conclusion

This study provided a profile of the vast health literacy challenges, and some health literacy strengths, that people are experiencing in Egypt. The HLQ provides information about potential areas of action and is the basis of the OPtimise HEalth LIteracy and Access (Ophelia) process, a community co-design process for taking action to improve health literacy. The Ophelia process has been adopted by the World Health Organization to support rapid and systematic development of interventions to prevent and control noncommunicable diseases [4,45]. This health literacy work in Egypt is ongoing and includes using the Ophelia process to develop and implement health literacy responsive interventions for fishermen and their families.

Supporting information

S1 Data.
(XLSX)

Acknowledgments

We acknowledge the contribution of Melanie Hawkins for her detailed editing of this manuscript.

Author Contributions

Conceptualization: Wagida A. Anwar, Nayera S. Mostafa.

Data curation: Dalia G. Sos.

Formal analysis: Dalia G. Sos.

Funding acquisition: Wagida A. Anwar, Nayera S. Mostafa.

Investigation: Wagida A. Anwar.

Methodology: Nayera S. Mostafa, Sally Adel Hakim, Dalia G. Sos, Richard H. Osborne.

Project administration: Wagida A. Anwar, Nayera S. Mostafa.

Resources: Wagida A. Anwar.

Supervision: Wagida A. Anwar, Nayera S. Mostafa.

Writing – original draft: Wagida A. Anwar, Nayera S. Mostafa, Sally Adel Hakim, Dalia G. Sos, Dena A. Abozaid.

Writing – review & editing: Wagida A. Anwar, Nayera S. Mostafa, Sally Adel Hakim, Dalia G. Sos, Richard H. Osborne.

References

1. Batterham RW, Hawkins M, Collins PA, Buchbinder R, Osborne RH. Health literacy: applying current concepts to improve health services and reduce health inequalities. Public Health 2016; 132: 3–12

2. Dodson S, Good S, Osborne RH. Health literacy toolkit for low- and middle-income countries: a series of information sheets to empower communities and strengthen health systems. New Delhi: 2015. World Health Organization, Regional Office for South-East Asia.

3. Trezona A, Dodson S, Osborne RH. Development of the Organizational Health Literacy Responsiveness (Org-HLR) Framework in Collaboration with Health and Social Services Professionals. BMC Health Services Research. 2017; 17:513. https://doi.org/10.1186/s12913-017-2465-z PMID: 28764699

4. Abdel-Latif MMM, Saad SY. Health literacy among Saudi population: a cross-sectional study. Health Promot Int. 2017; Feb 1; 34(1):60–70. https://doi.org/10.1093/heapro/dax043 PMID: 28973389

5. Abdel Rahman TT. Health literacy: prevalence among elderly care givers and its impact on the frequency of elderly hospitalization and elderly health related quality of life. Advances in Aging Research. 2014; 3: 380–387.

6. Almaleh R, Helmy Y, Farhat E, Hasan H, Abdelhafez A. Assessment of health literacy among outpatient clinics attendees at Ain Shams University Hospitals, Egypt: a cross-sectional study. Public health Journal. 2017; 151: 137–145.

7. Udolisa REK, Akinyemi AA, Olaoye OJ. Occupational and health hazards in Nigerian coastal artisanal fisheries. Journal of Fisheries and Aquatic Science. 2013; 8(1):1420.

8. Jeżewska M, Grubman-Nowak M, Leszczyñska I, Jaremin B. Occupational hazards for fishermen in the workplace in Polish coastal and beach fishing—a point of view. Int Marit Health. 2012; 63(1):40–48. PMID: 22669811

9. Ben-Yami M. Risks and dangers in small-scale fisheries: an overview. International Labour Organization. 2000. Available from: http://www.ilo.org/public/libdoc/ilo/2000/100B09_208_engl.pdf

10. Kaerlev L, Dahl S, Nielsen PS, Olsen J, Hannerz H, Jensen A, et al. Hospital Contacts for Chronic Diseases among Danish Seafarers and Fishermen: A Population-Based Cohort Study. Scand J Public Health. 2007; 35: 481–489. https://doi.org/10.1080/14034940701267385 PMID: 17852993

11. Kaerlev L, Jensen A, Nielsen PS, Olsen J, Hannerz H, Tüchsen F. Hospital contacts for injuries and musculoskeletal diseases among seamen and fishermen: a population-based cohort study. BMC Musculoskelet Disord. 2008; 23 (9):8

12. Frantzeskou E, Kastania AN, Riza E, Jensen OC, Linos A. Risk factors for fishermen's health and safety in Greece. International Maritime Health. 2012; 63(3): 155–161. PMID: 23129097

13. Percin F, Akyol O, Davas A, Saygi H. Occupational health of Turkish Aegean small-scale fishermen. Occup Med (Lond). 2012; 62:148–151.

14. Woodhead AJ, Abernethy KE, Szaboova L, Turner RA. Health in fishing communities: A global perspective. Fish Fish. 2018; 00:1–14. Available from: https://doi.org/10.1111/faf.12295.

15. El-Saadawy ME, Soliman NE, El-Tayeb IMM, Hammouda MA. Some occupational health hazards among fishermen in Alexandria city. Gaziantep Med J. 2014; 20 (1):71–78.

16. Rahman MM, Haque MM, Akhteruzzman M, Khan S. Socioeconomic features of a traditional fishing community beside the old Brahmaputra river, Mymensingh, Bangladesh. Asian Fisheries Science.2002; 15(4):371–386.

17. Ramon de la Fuente J. Universities and the health of the disadvantaged in Mexico. Universities and the health of the disadvantaged. WHO, Geneva. 2001. [cited 2020 May 6]. Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.112.8929&rep=rep1&type=pdf.

18. Santana P. Poverty, social exclusion and health in Portugal. Social Science and Medicine. 2002; 55, 33–45. https://doi.org/10.1016/s0277-9536(01)00218-0 PMID: 12137187

19. Frantzeskou E, Jensen O, Linos A. Prevalence of Health Risk Factors among Fishermen–A Review. Occup Med Health Aff.2014; 2 (2): 157.

20. Osborne RH, Batterham RW, Elsworth GR, Hawkins M, Buchbinder R. The grounded psychometric development and initial validation of the Health Literacy Questionnaire (HLQ). BMC Public Health.

2013; 13:658 Available from: http://www.biomedcentral.com/1471-2458/13/658 https://doi.org/10.1186/1471-2458-13-658 PMID: 23855504

21. Batterham RW, Buchbinder R., Beauchamp A., Dodson S, Elsworth GR, Osborne RH. The Optimising Health LItAcy (OPHELIA) process: study protocol for using health literacy profiling and community engagement to create and implement health reform. BMC Public Health. 2014; 14:694. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4147-5 PMID: 25002024

22. Beauchamp A, Buchbinder R, Dodson S, Batterham RW, Elsworth GR, McPhee C, et al. Distribution of health literacy strengths and weaknesses across socio-demographic groups: a cross-sectional survey using the Health Literacy Questionnaire (HLQ). BMC Public Health. 2015; 15: 678. https://doi.org/10.1186/s12889-015-2056-z PMID: 26194350

23. O'Hara J, McPhee C, Dodson S, Cooper A, Wildey C, Hawkins M, et al. Barriers to breast cancer screening among diverse cultural groups in Melbourne, Australia. International journal of environmental research and public health, 2018; 15(8):1677.

24. Hawkins M, Elsworth GR, Osborne RH. Application of validity theory and methodology to patient-reported outcome measures (PROMs): building an argument for validity. Qual Life Res. 2018; 27: 1695. Available from: https://doi.org/10.1007/s11136-018-1815-6 PMID: 29464456

25. Kolarcik P, Belak A, Osborne RH. The Ophelia (Optimise Health Literacy and Access) Process Using health literacy alongside grounded and participatory approaches to develop interventions in partnership with marginalized populations. The European Health Psychologist. 2015; 17(6):297–308.

26. Maindal HT, Kayser L, Norgaard O, Bo A, Elsworth GR, Osborne RH. Cultural adaptation and validation of the Health Literacy Questionnaire (HLQ): robust nine-dimension Danish language confirmatory factor model. Springer Plus. 2016; 5:1232. https://doi.org/10.1186/s40064-016-2887-9 PMID: 27536516

27. Nolte S, Osborne RH, Dwinger S, Elsworth GR, Conrad ML, Rose M, et al. German translation, cultural adaptation, and validation of the Health Literacy Questionnaire (HLQ). PLoS ONE. 2017; 12(2): e0172340. https://doi.org/10.1371/journal.pone.0172340 PMID: 28234987

28. Jessup RL, Osborne RH, Beauchamp A, Bourne A, Buchbinder R., Health literacy of recently hospital-ised patients: a cross-sectional survey using the Health Literacy Questionnaire (HLQ). BMC Health Services Research. 2017; 17(1):52. https://doi.org/10.1186/s12913-016-1973-6 PMID: 28103914

29. Debussche X, Lenclume V, Balcou-Debussche M, Alakian D, Sokolowsky C, Ballet D, et al. French adaptation of the Health Literacy Questionnaire: psychometric properties and usefulness in a population at risk for metabolic and cardiovascular disease. Sage Medicine. 2018; 6:1–12. Available from: https://doi.org/10.1177/2050312118801250

30. Hawkins M, Osborne R. Health Literacy Questionnaire (HLQ)–translation and cultural adaptation procedure. 2013. Burwood, VIC, Australia: Deakin University.

31. Hawkins M, Cheng C, Elsworth GR, Osborne RH. Translation method is validity evidence for construct equivalence: secondary analysis of data routinely collected during translations of the Health Literacy Questionnaire (HLQ). BMC Medical Research Methodology (in press).

32. Cohen J. Statistical power analysis for behavioral sciences (revised ed.). 1977. New York: Academic.

33. Chan K, Fang W. Use of Internet and traditional media among young people. Young Consumers, 2007; 8(4):244–256.

34. Ahmed RR, Hanif M, Meenai YA. Relationship between Demographic and Internet Usage. Journal of Information Engineering and Applications. 2015; 5(10): 32–38.

35. Ailawadi A. Villagers In India Use Internet To Communicate More Than For Social Networking. Bloombergquint. 2019. Available from:https://www.bloombergquint.com/technology/villagers-in-india-use-internet-to-communicate-more-than-social-networking#gs.2z5cx8

36. John M. Internet Usage: Urban vs. Rural. 2017. [cited 2019 March 27]. Available from: https://thecoders.vn/internet-usage-urban-vs-rural/

37. Pena PGL and Gomez CM. Health of subsistence fishermen and challenges for Occupational Health Surveillance. Ciência & Saúde Coletiva. 2014; 19(12):4689–4698, 2014. https://doi.org/10.1590/1413-812320141912.13162014 PMID: 25388177

38. Mandal S, Hasan I, Hawlader NH, Sultana I, Rahman M, Majumder SI. Occupational Health Hazard and Safety Assessment of Fishermen Community in Coastal Zone of Bangladesh. International Journal of Health Economics and Policy. 2017; 2(2):63–71. https://doi.org/10.11648/j.hep.20170202.14

39. Paasche-Orlow MK, Parker RM, Gazmararian JA, Nielsen-Bohlman LT, Rudd RR. The prevalence of limited health literacy. Journal of General Internal Medicine. 2005; 20: 175–184. https://doi.org/10.1111/j.1525-1497.2005.40245.x PMID: 15836552

40. Messick S. Validity of psychological assessment: Validation of inferences from persons responses and performances as scientific inquiry into score meaning. 1994. Educational Testing Service, Princeton, N.J. [cited 2019 March 27]. Available from: https://files.eric.ed.gov/fulltext/ED380496.pdf

41. Beauchamp A, Batterham RW, Dodson S, Astbury B., Elsworth GR., McPhee C., et al. 2017. Systematic development and implementation of interventions to OPtimise Health Literacy and Access (Ophelia). BMC Public Health (2017) 17:230 https://doi.org/10.1186/s12889-017-4147-5 PMID: 28253883

42. WHO, 2020. Why health literacyis important. [cited 2020 May 6]. Available from http://www.euro.who.int/en/health-topics/disease-prevention/health-literacy/why-health-literacy-is-important.

43. Pfizer, 2018. The Newest Vital Sign (NVS): A health literacy assessment tool. [cited 2019 May 20]. Available from: https://www.pfizer.com/health/literacy.

44. Parker RM, Baker DW, Williams MV, Nurss JR. The test of functional health literacy in adults: a new instrument for measuring patients' literacy skills. J Gen Intern Med. 1995 Oct; 10(10):537–41. https://doi.org/10.1007/BF02640361 PMID: 8576769

45. Batterham RW, Beauchamp A, Osborne RH. Health Literacy. In Quah Stella R. (Ed), International Encyclopedia of Public Health, Second Edition. 2017; 2:428–437. Available from: http://dx.doi.org/10.1016/B978-0-12-803678-5.00190–9.