Designing Printed Educational Materials about Healthy Habits Related to Coronavirus

Asem A. Ahmed 1, Sahar M. Soliman2, Dalia E. Khalil 3

1Demonstrator, Community Health Nursing Department, Faculty of Nursing, Mansoura University, Dakahlia Governorate, Dakahlia 35931, Egypt

2 Professor, Community Health Nursing Department, Faculty of Nursing, Mansoura University, Dakahlia Governorate, Dakahlia 35931, Egypt

3 Lecturer, Community Health Nursing Department, Faculty of Nursing, Mansoura University, Dakahlia Governorate, Dakahlia 35931, Egypt

1.ABSTRACT

Background: Coronavirus disease is a recent global health threat and a public health emergency of international concern. Printed Educational Materials (PEMs) is considered one of the main methods for health education that are widely used to increase awareness among low health litreracy population. **Aim:** To design PEMs about healthy habits related to Coronavirus. **Method:** Cross-sectional study design and Delphi method were used throughout this study. Non-probability sampling techniques were used to recruit study participants. The study was conducted at Faculty of Nursing, Mansoura University in addition to 17 primary health care settings at Mansoura district. The sample size was 15 professional experts and 16 academic staff from Faculty of Nursing, Mansoura University. In addition to 17 health educators and 136 low health literacy population from the selected settings. The researchers used six tools for preliminary assessment, Delphi survey and designed PEMs evaluation. The researchers developed all the tools except tool six adopted from (Heyne, 2017). **Results:** All Delphi survey panels achieved concensus with at least 75% agreement regarding all designing principles of both booklet and pamphlet with positive correlation implied consistent validity of the quality score of the designed PEMs. **Conclusion:** The researchers concluded that incorporating both professional experts and PEMs users with the low health literacy population preferences in the design process of PEMs provides a more holistic design. **Recommendations:** The researchers recommended that conducting health education campaigns and disseminating the designed PEMs for low health literacy individuals to improve their preventive practices toward COVID-19.

Keywords: COVID-19, Healthy behaviors, Low health literacy, Printed educational materials.

2.Introduction

Coronavirus (COVID-19) is a contagious respiratory disease caused by Severe Acute Respiratory Syndrome-Coronavirus-2 (SARS-CoV-2) **(Baloch, Baloch, Zheng, & Pei, 2020).** SARS-CoV-2 is transmitted between people through respiratory droplets and contact routes **(Moubarak, M. 2021).** Due to the rapid spread and sustained transmission of the disease to many countries, the world health organization (WHO) declared the outbreak as a public health emergency of international concern on 30 January 2020 and a global pandemic on 11 march 2020. Thus, the prevention and control of the pandemic cannot be ignored **(Agencia de Union Europea, 2020; Tadesse et al., 2020)**.

Everyone should maintain healthy habits in daily living inside house with family members and outside house when dealing with others, at work, and in the community for protection from getting COVID-19 **(Jia et al., 2021).** Hand washing, wearing a mask, and physical distancing are three important healthy behaviors should be followed to reduce the spread of COVID-19 **(Doung-Ngern et al., 2020; Fakhira et al., 2021)**.

Population with high health literacy aware and adhere these healthy behaviors which play an integral role in determining a society's readiness to accept health authorities´ measures and determining a path through the pandemic **(Alahdal, Basingab, Alotaibi 2020 & Zhong, 2020).** A key component of increasing health literacy is to provide high quality and effective educational materials **(Heyne, 2017). According to Hickey et al., 2018 "**low health literacy is associated with population who are older and have limited education" so low health literacy population may not be able to understand comprehend educational materials **(Heyne, 2017)**.

Booklet and pamphlet are common types of PEMs are included of the main methods for health education and are widely used to increase awareness among low health literacy population **(Haji, 2019; Kealey, 2015)**. The PEMs are simple, relatively inexpensive knowledge translating intervention and have certain advantages that support learning process over the electronic format **(Grudniewicz et al., 2015; JAYA, 2018; Nasrullah, 2019; SINTYA, 2019)**. Therefore, users of PEMs should provide suitable PEMs for those with their skills **(Heyne, 2017)**.

Aim of the Study

To design PEMs about healthy habits related to Coronavirus

3.Method

3.1Design:

The researchers used the cross-sectional and Delphi design to conduct the current study.

3.2Setting:

This study was carried out at community health nursing department, Faculty of Nursing, Mansoura University in addition to primary health care settings at Mansoura district.

3.3Sampling size and technique:

I. Sampling of primary health care settings.

According to quota sampling technique, the primary health care settings included two main strata. In the first strata stratifying lines according to geographical location while in the second strata, primary health care settings were selected from each line strata used judgmental sampling technique according to density of attendance which represent 13 out of 39 in rural areas and 4 health offices out of 10 in urban areas at Mansoura district **Table (1).**

II. Sampling of participants

A. Delphi survey panels

1. *Users of PEMs.* The researchers recruited 33 PEMs users in this study judgmentally; 16 academic staff from the community health nursing department, Faculty of Nursing, Mansoura University, and 17 health educators (One health educator per each selected primary health care setting)

2. *Professional experts.* **According to Somani, N., Beukes, E., Latham, K., Andersson, G., & Allen, P. M., 2021,** the researchers used judgmental sampling technique to recruit 15 professors and assisstant professors from community health nursing department and geriatric health nursing department, Faculty of nursing, Mansoura university who had experience in health education and research for Delphi rounds and final evaluation of the designed PEMs.

B. Low health literacy population. According to **Dti et al., 2016,** each FGD included 8 participants. The total number of low health literacy population selected was 136 clients. They were divided into relevant or homogeneous strata to ensure representation of the subgroups in the sample recruited from each primary health care setting. Their age ranged from 20 to 60 years **(Brinsky, 2006)**. Used purposive sampling technique **Table (1)**

III. Tools for data collection

The researchers designed five tools for data collection and adopted tool six after reviewing the relevant literatures as the following:

Tool I: A socio-demographic and occupational structured interview: This tool included two parts to assess socio-demographic and occupational data of participants: part (1) concerned with Delphi survey panels such as years of experience while part (2) concerned with low health literacy population such as their age and educational level **(Malik et al., 2015; Firouzbakht et al., 2021)**.

Tool II: Low health literacy population preferences focus group discussion (FGD). This tool composed of 10 open-ended questions to explore their preferences regarding the principles of PEMs such as their preferred content principles.

Tool III: Electronic Delphi survey questionnaire. The researchers used this tool in the first round to explore opinions of Delphi survey panels regarding the principles of the PEMs design for low health literacy population about healthy behaviors related to coronavirus. It included 10 open ended questions.

Tool IV: Electronic Delphi survey checklist. The researcher used this tool in Google Forum in the second and third rounds to obtain consensus from the Delphi survey panels in relation to the structure and content of the designed PEMs (booklet and pamphlet). It included closed-ended statements; 51 statements were used for both booklet and pamphlet with additional 4 statements for booklet only. All statements required a response on five-points Likert-rating scale (strongly agree, agree, neutral, disagree, strongly disagree).

Scoring System; the level of agreement in the second and third rounds according to **Persai, D., Panda, R., & Kumar, R., 2016** was identified as; strong consensus when at least 75%, moderate consensus from 60% to 74%, and absence of consensus when less than 60% of respondents reached an agreement on individual items of the questionnaire.

Tool V: Delphi survey panels' evaluation checklist. The researchers adopted the standard Subject Matter Expert Written Patient Education Checklist (SMEWPEC) scale from **(Heyne, 2017)** to evaluate the final draft of the designed PEMs by Delphi survey panels. SMEWPEC consisted of 27 items requiring a response of "superior, adequate, and not suitable" with a score of 2, 1, and 0 points respectively on three-point likert rating scale with an additional "N/A" option if the item does not apply to the material being evaluated.

Tool VI: Low health literacy population feedback evaluation checklist. The researchers used this tool to obtain their feedback regarding the designed PEMs and it included 16 items requiring a response of "agree, neutral, and disagree" with a score of 2, 1, and 0 points, respectively on three-point likert rating scale.

Scoring System; the total feedback evaluation scoring system ranged from 0 to 32 scores [Poor evaluation score <50% (<16 score), fair evaluation score from 50% to <75% (from 16 to < 24 scores and good evaluation score ≥75% (≥24 scores)

3.4 Procedure

The researchers conducted this study throughout two main phases as:

Phase I: preparatory phase

1. **Administrative process.** The researchers obtained an official permission from the dean of Faculty of Nursing, Mansoura University after clarifying the purpose of the study. The researchers submitted the letter to the directorate of Health Affairs in Dakahlia governorate to obtain approval from selected health care settings managers to conduct the study. Then clarified the purpose of the study, determined the starting time of the study and explained the study process to gain their cooperation and support during data collection.

2. **Ethical consideration.** The researchers obtained the ethical approval from research ethics committee of faculty of nursing, Mansoura university and obtained informed consent from the participants. The

researchers assured participants that their participation in the study was voluntary. They informed that the collected data will be treated anonymously, confidentially and used for the purpose of the study.

3. **Literature review.** Reviewing of past, current, national, and international literatures on the principles of PEMs, health literacy, and health habits related to corona virus using scientific published articles, internet search and textbooks.

4. **Developing study tools.** The researchers developed 5 tools for data collection after reviewing the related literatures and adopt SMEWPEC scale. **(Heyne, 2017).**

Validity and reliability of the study tools.

▪ Five experts in the field of community health nursing tested the face and content validity of the developed tools and the researcher carried out the required modifications.

▪ Then carried out the pilot study on (10%) of low health literacy population (N=14) who had been excluded from the studied sample. The pilot study was carried out to test the clarity, reliability, and applicability of the study tools for estimating the approximate time required for data collection, identifying the possible obstacles that may hinder data collection. Accordingly, the researchers made the required modifications.

▪ Reliability for the developed tools was assured by means of the Cronbach α coefficient in SPSS program version 20, which revealed acceptable level that ranged from 0.72 to 0.80. Where scores higher than (0.70) were considered acceptable.

Phase II: Operational phase. This phase included three stages as the following:

Stage 1: Initial data collection. The researchers started to collect data in the beginning of Jinuary 2022 to the end of April 2022. Collection was carried out for four months. The researchers interviewed the low health literacy population (N=136) to assess their socio-demographic and occupational data and preferences regarding the principles of PEMs design within 30-40 minutes using tools [I, II].

Stage 2: Internal validity of the PEMs. Delphi survey was used for designing the PEMs (booklet and pamphlet). The Delphi technique involved the PEMs' users due to their experience in health education and professional experts due to their academic position, education, and research

through three sequential rounds. Two weeks were given for each Delphi round. The researchers sent the questionnaires via E-mail with a formal letter of invitation to participate as members of the Delphi survey panels. A brief explanation on the Delphi procedure and the aim of study with instruction to complete the questionnaire **(Ab Latif et al., 2017)**.

Designing the prototype of PEMs was based on FGD findings of preliminary assessment. The coordinator conducted 17 FGD sessions at 17 the previous mentioned settings in private rooms. **In the first round**, beased on the responses of Delphi survey panels, the researchers designed the prototype of the PEMs. *In the second round*, the researchers began forming the consensus and received the actual outcomes responses of Delphi survey panels regarding the prototype of PEMs. While, *in the third round,* the researchers sent to Delphi survey panels the modified draft of the PEMs with pooled list of the modified content areas and items of the PEMs that did not achieve consensus in the second round.

Delphi survey checklist was used in the second and third rounds.

Stage 3: Evaluation of designed PEMs. All the studied participants evaluated the designed PEMs using Tools V and VI. The PEMs validation is to confirm the functionality and appropriateness of the booklet and pamphlet. The researchers did the recommended modifications.

3.5Statistical analysis

The researchers illustrated the qualitative data using thematic analysis. Then analyzed the discussion transcripts to extract the common themes, similarities, and/or variations among the participants' views. The researchers coded the data, identified under categories, subcategories, and organized together under common themes. Also, they coded the quantitative data, entered, and analyzed using Statistical Package for the Social Sciences (SPSS) program version 20.0. Then presented the data using descriptive statistics; the arithmetic mean and standard deviation for describing continuous variables while frequencies and percentages for describing categorical variables. Spearman test was used for correlation testing, Cronbach α and intraclass correlation were used to assess the internal consistency of the individual items and the degree of the reliability among the Delphi panelists. All tests were performed at a level of significance (P-value) equal or less than 0.05 was considered statistically significant.

4.Results

Figure (1) reveals that 38.2% of the studied low health literacy populations aged ٣0<٤0 years with a mean 36.82 (9.32) while **figure (2)** reveals that 50% of them have preparatory certificate. **Relating low health literacy population preferences of the PEMs design,** they preferred clear, simple and concise content which suitable to their age, level of education and culture. They preferred to start the PEMs from simple to difficult and from most familiar to least. In addition to clear font type and big font size with simple and clear visual cues and visual aids. The cover should be simple, attractive and colorful with a relevant title and photo.

Table (2) conveys that 43.8% and 23.5% of the academic staff and health educators have experience in health education from 10<15 years respectively. The results clarified that 87.5%, 70.6% and 80.0% of the studied academic staff, health educators and professional experts used booklet respectively. While 68.8%, 47.1% and 40% of them used pamphlet in the health education respectively.

Table (3) reports that at the end of the first round, Delphi survey panels suggested 51 principles/ criteria to design PEMs (pamphlet and booklet) as content, word, organization, typography, layout, graphic and culture appropriatness with addition to 4 principles for booklet regarding organization domain.

Figure (3) shows that 99.3% of low health literacy population gave good score for the booklet content, graphics, layout & typography, and the cultural appropriateness. All of them (100%) gave good score for the pamphlet domains.

Table (4) documentes that at the end of the second round of this study all Delphi survey panels reached a consensus with ≥ 75% agreement that the content is updated, concise and relevant to the topic. Moreover, the designed PEMs highlight the main concepts, start from simple to difficult with most important first and main head points, used clear visual cues which relevant to topic and use pictures which consider learner culture.

Table (5) illustrates that at the end of the third round of this study that all Delphi survey panels reached a consensus with ≥ 75% agreement that the content is organized, clear and simple. Moreover, the font size is not less than 12 for text, cluttering images are avoided and PEMs are suitable to the learners' level of education.

Table (6) finds that the spearman rank correlation coefficient between each domain scores of feedback assessment of the studied Delphi survey panels (based on SMEWPEC checklist) and the overall quality scores' evaluation of the designed PEMs is significant ($p \leq 0.05$). Result indicated significant positive correlations between scores of each domain of "feedback" assessment and its overall quality scores' evaluation of both designed PEMs. This positive correlation implied consistent validity of the quality score of the designed PEMs.

Table (7) reveals that the spearman rank correlation coefficient between each domain scores of feedback assessment of the studied low health literacy population and the overall quality scores' evaluation of the designed PEMs was significant ($p \leq 0.05$). Result indicated significant positive correlations between scores of each domain of"feedback" assessment and its overall quality scores' evaluation of the designed bookletand pamphlet. This positive correlation implied consistent validity of the quality score of the designed PEMs.

Table (8) shows that there was a high degree of reliability between Delphi survey panels' scores (33 PEMs users and 15 professional experts) in all domains for booklet and pamphlet. Regarding the booklet, it was found that the average of raters' scores ICC was ranged from 0.562 to 0.821 which significantly differs from the single rater ICC that ranged from 0.300 to 0.604. Regarding the pamphlet, it was found that the average of raters' scores ICC was ranged from 0.644 to 0.896 which significantly differs from the single rater ICC that ranged from 0.472 to 0.741. The analysis of reliability of feedback domains indicated internal consistency for booklet and pamphlet as indicated by Chronbach α. The average of raters' scores ICC indicted good agreement level for all feedback domains for the designed PEMs

Table (1): Distribution of the selected primary health care settings from different strata and distribution of selected low health literacy population

| Number of selected primary health care settings (substrata) and number of selected low health literacy population									
Geographical area	Rural area					Total	Urban area		Total
Lines	Tanah	Menyet Sandoub	Salamon	El-Baramon	Wesh El-Hagar	5 lines	East	West	2 lines
Number of substara/ line	18	7	5	7	2	39 Health care units	5	5	10 Health offices
Selected substara/ line	Meet El-Sarem unit	Menyet Sandoub unit	Salamon El-Komash unit	El-Khayrya unit	Meet Khamis unit		Second health office	Third health office	
	Sallant unit	Shawa unit		El-Badala unit	Wesh El-Hagar unit		Meet Hadar health office	First childcare office	
	Barq El-Ezz unit			El-Baramon unit					
	Godayeda El-Hala unit								
	Meet Ali unit								
Total	5	2	1	3	2	13 Health care units	2	2	4 Health offices
Number of selected low health literacy population/ line	40	16	8	24	16	104	16	16	32
Grand total	Number of primary health care settings = 17 Total number of selected low health literacy population = 136 individuals								
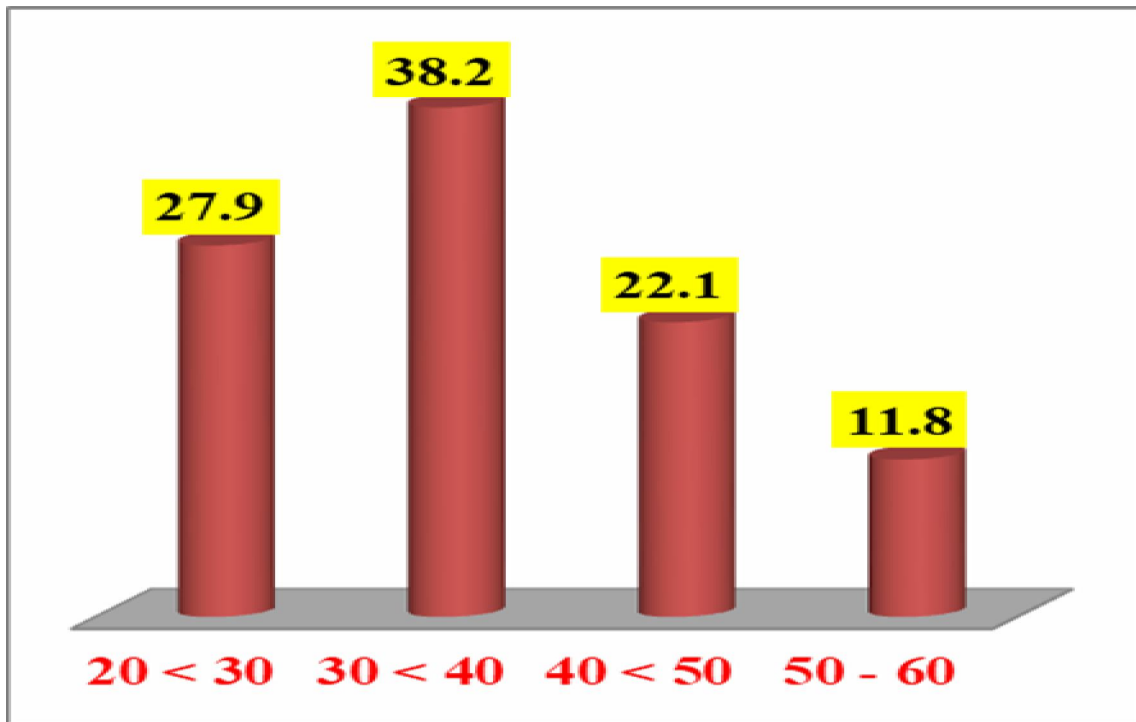
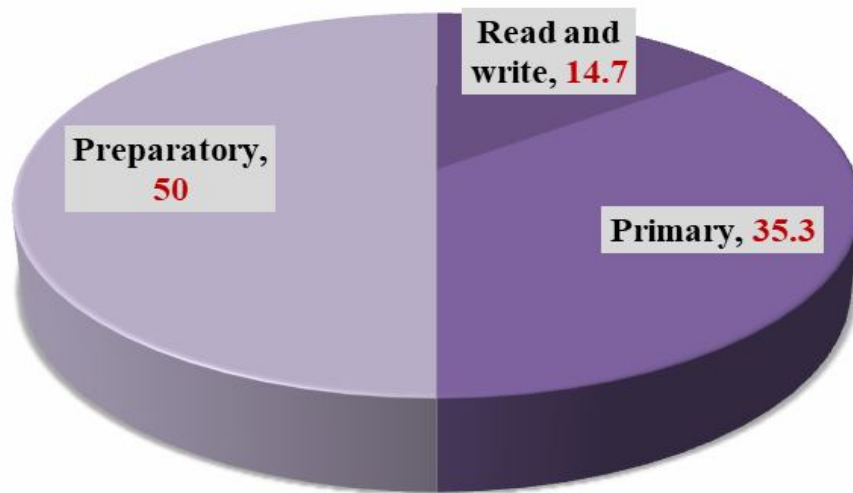**Figure (1)** *Low health literacy population age*

Figure (2) *Low health literacy population level of education*

Table (2) *Delphi survey panels' socio-demographic and occupational characteristics.*

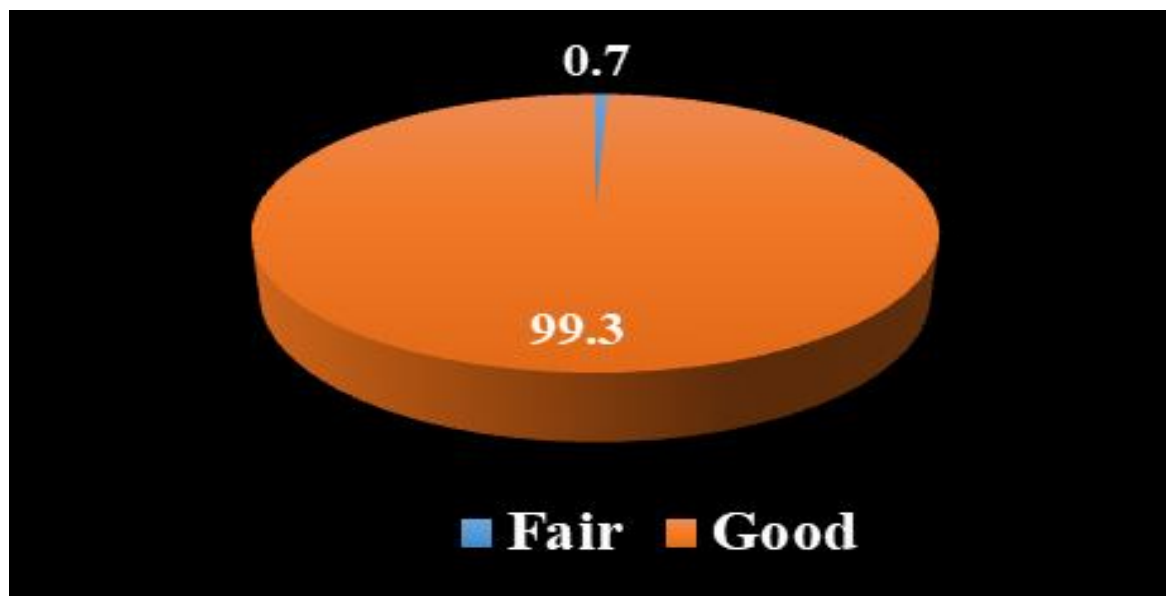| Items	Academic staff		Health educato		Professional experts	
	N=16	*%*	*N=17*	*%*	*N=15*	*%*
Level of professional educational qualification						
Master degree	6	37.5	0	0	0	0
Doctorate degree	10	62.5	0	0	15	100
Institute of technical health	0	0	13	76.5	0	0
Bachelor	0	0	4	23.5	0	0
Years of experience in health education						
1 < 5	1	6.2	3	17.6	0	0
5 < 10	4	25.0	5	29.4	0	0
10 < 15	7	43.8	4	23.5	0	0
15 < 20	4	25.0	4	23.5	3	20
20 < 25	0	0	1	5.9	10	66.7
25 - 30	0	0			2	13.3
$\overline{X}$ **(SD)**	11.69 (4.79)		10.71 (5.88)		21.47 (3.39)	
Training type if present*						
Seminars/ workshops offered by the faculty	7	43.8	0	0	4	26.7
Seminars/ workshops offered by another institution	5	31.2	0	0	5	33.3
Academic training courses	2	12.5	0	0	6	40
Seminars/ workshops offered by the health directorate	0	0	14	82.4	0	0
Types of instructional materials which often used in health education*						
Booklet	14	87.5	12	70.6	12	80
Pamphlet	11	68.8	8	47.1	6	40
Flipchart	7	43.8	0	0	3	20
Poster	8	50.0	3	20	0	0
Leaflet	5	31.2	0	0	0	0
Package	4	25.0	0	0	0	0

Note. * The percentage can be more than 100% as more than one answer was allowed

$\overline{X}$ **(SD)** = Mean (Standard Deviation)

Table (3) *Round 1 Survey results of the Delphi survey panels regarding the principles of the PEMs design*

Domains	Booklet	Pamphlet
Content & words	16	16
Organization	11	7
Typography	4	4
Layout	3	3
Graphics	16	16
Cultural appropriateness	5	5
Total number of principles	55	51

Figure (3) *Low hwlath literacy population total feedback scoring regarding the designed PEMs.*

Table (4)*Round 2 survey results of Delphi survey panels regarding the prototype of the PEMs.*

Domains	Criteria	Academic staff (N=16)				Health educators (N=17)				Professional experts (N=15)			
		Median (IQR)		*Consensus achieved and agreement (%)*		*Median (IQR)*		*Consensus achieved and agreement (%)*		*Median (IQR)*		*Consensus achieved and agreement (%)*	
		Booklet	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*
Content & words	Content is updated	4(1)	4(1)	100	100	5(1)	4(1)	100	82.4	5(1)	4(1)	100	100
	Content is concise	4.5(1)	5(1)	87.5	87.5	4(1)	4(1)	94.1	82.4	4(1)	4(1)	80	80
	Content is relevant to the topic	5(0)	5(0)	100	100	5(1)	4(1)	100	94.1	4(1)	4(1)	100	93.3
	Words convey one meaning	5(1)	5(1)	100	100	5(1)	5(1)	100	94.1	4(1)	5(1)	100	93.3
Organization	PEMs highlight the main concepts	4(1.75)	4.5(1)	75	87.5	5(1)	4(1)	100	94.1	4(1)	5(1)	100	93.3
	PEMs start from simple to difficult	5(1)	5(1)	100	93.8	4(1)	4(1)	100	94.1	5(1)	4(1)	93.3	86.7
	PEMs start with most important first	5(1)	4(1)	93.8	81.2	5(1)	5(1)	100	94.1	5(1)	4(1)	93.3	86.7
	PEMs use headings and subheadings	5(1)	5(0)	100	100	4(1)	4(1)	100	94.1	5(1)	4(1)	100	93.3
Typography	Font style is Time New Romans	5(0)	5(1)	100	87.5	5(1)	4(1)	100	88.2	4(1)	4(1)	93.3	86.7
Layout	Visual cues are clear	5(1)	5(1)	100	87.5	5(1)	4(1)	94.1	82.4	4(1)	4(1)	93.3	86.7
	Visual cues are understood	5(1)	5(1)	93.8	93.8	4(1)	4(1.5)	94.1	76.5	4(1)	4(1)	93.3	86.7
	Visual cues are simple	5(1)	5(1)	100	93.8	4(1)	4(1)	100	88.2	4(1)	4(1)	100	86.7
Graphics	Visual aids are relevant to the topic	4(1)	4.5(1)	87.5	87.5	5(1)	5(1)	100	88.2	5(1)	4(1)	100	100
	Visual aids are high-quality	5(1)	4.5(1)	100	93.8	4(1)	4(1)	100	88.2	5(1)	4(1)	100	100
	Cover page is simple	5(1)	5(1)	100	100	5(1)	5(1)	100	82.4	4(1)	4(1)	93.3	86.7
Cultural appropriateness	PEMsuse pictures which consider learning culture	4.5(1)	4(1)	87.5	87.5	4(1)	4(1)	88.2	82.4	4(1)	4(1)	86.7	80
	Instructions/ recommendations are applicable from the society	5(1)	5(1)	93.8	87.5	5(1)	5(1)	94.1	88.2	5(1)	5(1)	100	93.3

Strong consensus = SC (75% and more)   **No consensus= NC** (less than 60%)   **Moderate consensus= MC** (60% -74%)   *** IQR= inter quartile range**

Table (5) *Round 3 survey results of Delphi survey panels regarding the designed PEMs*

Domains	Criteria	Academic staff (N=16)				Health educators (N=17)				Professional experts (N=15)			
		Median (IQR)		*Consensus achieved and agreement (%)*		*Median (IQR)*		*Consensus achieved and agreement (%)*		*Median (IQR)*		*Consensus achieved and agreement (%)*	
		Booklet	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*	*Booklet*	*Pamphlet*
Content & Words	Content is organized	5(1)	4(1.75)	87.5	75	5(1)	5(1)	88.2	88.2	5(1)	4(1)	100	86.7
	Content is clear	5(1)	4.5(1)	81.2	93.8	4(1)	4(1)	88.2	94.1	5(1)	4(1)	93.3	93.3
	Content is simple	5(1)	4(0.75)	93.8	81.2	4(1)	4(1)	94.1	88.2	5(1)	4(1)	93.3	80
	Content is knowledgeable	4(1.5)	4(1)	75	87.5	4(1)	4(1)	82.4	82.4	4(1)	4(1)	93.3	86.7
	Paragraphs are limited to 3 to 5 sentences	5(1)	4(1)	87.5	87.5	5(1)	4(1)	100	88.2	5(1)	4(1)	100	86.7
	Used symbols are limited	4(1)	4(1)	81.2	81.2	5(1)	4(1.5)	82.4	76.5	5(1)	4(1)	93.3	80
	Medical terms are not used	4.5(1)	4(1.75)	87.5	75	4(1)	5(1.5)	86.7	76.5	5(1)	4(1)	93.3	80
Typography	Font size is not less than 16 for headings	5(1)	5(1)	81.2	87.5	4(1)	4(1)	82.4	100	4(1)	4(1)	80	93.3
	Font size is not less than 14 for subheadings	5(1)	4(1)	93.8	87.5	5(1)	4(1)	88.2	88.2	5(1)	4(1)	100	93.3
	Font size is not less than 12 for text	5(1)	4(1)	87.5	81.2	5(1)	4(1)	82.4	82.4	5(1)	4(1)	86.7	86.7
Graphics	Visual aids are clear	5(0)	5(1)	100	87.5	5(1)	4(1)	100	82.4	4(1)	4(1)	93.3	93.3
	Cluttering images are avoided	4.5(1)	4(1.75)	87.5	75	5(1)	4(1)	88.2	82.4	4(1)	4(1)	80	86.7
Cultural appropriateness	PEMs are suitable to the level of education of target group	5(1)	4(1)	593.8	81.2	4(1.5)	4(1)	76.5	88.2	5(1)	4(1)	93.3	93.3
	PEMs are suitable to learner language	4.5(1)	4(1.75)	81.2	75	4(1)	4(1.5)	88.2	76.5	5(1)	4(1)	93.3	86.7

Strong consensus = SC (75% and more)   **No consensus= NC** (less than 60%)   **Moderate consensus= MC** (60% -74%)   *** IQR= inter quartile range**

Table (6) Correlation of domains scores of the Delphi survey panels' feedback and their overall assessment of the designed PEMs

Domains	Correlation with the overall assessment			
	Booklet		Pamphlet	
	R	P	R	P
Domain 1: Content	0.608	0.000	0.607	0.000
Domain 2: literacy demand	0.465	0.001	0.576	0.000
Domain 3: Graphics	0.372	0.009	0.290	0.046
Domain 4: Layout and typography	0.600	0.000	0.640	0.000
Domain 5: Learning Stimulation/Motivation	0.455	0.001	0.452	0.001
Domain 6: Cultural appropriateness	0.372	0.009	0.359	0.012

Note. R: for spearman correlation coefficient   * (P) Significant (P ≤ 0.05)

Table (7) Correlation of domains scores of the low health literacy population feedback with the overall assessment of the designed PEMs

Domains	Correlation with the overall assessment			
	Booklet		Pamphlet	
	R	P	R	P
Domain 1: Content	0.821	0.000	0.807	0.000
Domain 2: Graphics	0.250	0.003	0.363	0.000
Domain 3: Layout and Typography	0.509	0.000	0.679	0.000
Domain 4: Cultural appropriateness	0.359	0.000	0.424	0.000

Note. R: for spearman correlation coefficient   * (P) Significant (P ≤ 0.05)

Table (8) Internal reliability and intraclass correlation for Delphi survey panels' feedback domains

Domains	Single raters Interclass correlation (95% CI)		Average raters Interclass correlation (95% CI)		Cronbach α	
	Booklet	Pamphlet	Booklet	Pamphlet	Booklet	Pamphlet
Domain 1: Content	0.473 (0.169-0.750)	0.493 (0.182-0.765)	0.729 (0.380-0.900)	0.745 (0.400-0.907)	0.742	0.743
Domain 2: literacy demand	0.571 (0.273-0.808)	0.638 (0.353-0.845)	0.800 (0.530-0.927)	0.841 (0.621-0.942)	0.798	0.835
Domain 3: Graphics	0.472 (0.153-0.753)	0.741 (0.508-0.893)	0.728 (0.352-0.901)	0.896 (0.756-0.962)	0.721	0.896
Domain 4: Layout and typography	0.459 (0.149-0.743)	0.376 (0.051-0.694)	0.718 (0.345-0.896)	0.644 (0.140-0.872)	0.721	0.633
Domain 5: Learning Stimulation/ Motivation	0.604 (0.315-0.826)	0.741 (0.508-0.893)	0.821 (0.580-0.934)	0.896 (0.756-0.962)	0.821	0.896
Domain 6: Cultural appropriateness	0.300 (-0.027-0.643)	0.472 (0.153-0.753)	0.562 (-0.085-0.844)	0.728 (0.352-0.901)	0.545	0.721

Interclass correlation (ICC) values: - Less than 0.5 are indicative of poor agreement/ reliability

- 0.5 and 0.75 indicate moderate agreement/ reliability - 0.75 and 0.9 indicate good agreement/ reliability

- Greater than 0.90 indicate excellent agreement/ reliability

5.Discussion

There are many types of PEMs **(Sintya, 2019)**. In the current study the researchers designed booklet and pamphlet about healthy habits related to Covid-19 for low health literacy people as more than 70% and more than 40% of the studied PEMs users and professional experts used booklet and pamphlet respectively.

Collaborative planning in developing PEMs is an important characteristic of effective PEMs to avoid doing work in isolations as most educators do **(Richards, 2001; Sintya, 2019)**. It is the first study to use the Delphi method to design an attainable PEMs about COVID-19 for low health literacy population through the technical collaboration between researchers, professional experts, and PEMs users and evaluate them.

According to **Shariff 2015,** the key characteristics of a Delphi method are expert panel, iteration of rounds and controlled feedback, statistical summaries of group response, anonymity and consensus building. Accordingly, in the current study, the researchers conducted three successive Delphi survey rounds used a series of questionnaires that are completed anonymously by Delphi survey panels until a large extent of consensus is reached on the area of interest.

Based on the findings of the **first round,** the researchers designed the prototype of the attainable PEMs. The researchers designed the prototype of PEMs in simple Arabic language and relevant to low health literacy population preferences, age, level of education and culture. As learning about the participants' characteristics, and preferences allows more targeted materials **(CDC, 2020)**. This is in a line with findings of the current study as the total feedback score was good among most of the studied low health literacy population related to designed booklet and pamphlet.

Moreover, the qualitative analysis revealed the Delphi survey panels' preferences regarding six domains regarding principles of PEMs design including content, organization, typography, layout, graphics, and cultural appropriateness. The results are in agreement with **Heyne, 2017; Abrams et al., 2016; CDC, 2020** who reported that content should be updated, specific, concise and suitable to readers' needs.

Furthermore, the PEMs should organize the most important information at the beginning to avoid information overload. The results are in harmony with **Boyde & Peters, 2014; Grudniewicz, 2015; Abrams et al., 2016** who suggested that choosing a font for headings that offers variations in weight to give better options for creating good contrast. Moreover, the suggestion of Delphi survey panels are in harmony with **Kastner et al., 2014; Hung & Stones, 2014; Shoemaker et al., 2014** who stated that appropriate visual cues make the PEMs easy to skimand and the visuals should be recognizable, simple, uncluttered, and culturally appropriate.

Moreover, based on the findings of the first round, the researchers developed an electronic Delphi survey checklist which was used for the second and third rounds to achieve the consensus of the designed PEMs. In this study, all Delphi survey

panels achieved consensus for all evaluation items for final version of booklet and pamphlet with at least 75% agreement in the end of the **third round**. This indicates valid PEMs content and structure.

Regarding evaluation of the designed PEMs, the results showed that all criteria regarding all domains of SMEWPEC were covered. This reflects the high quality of the developed PEMs. The results corresponds with **Heyne, 2017** who designed SMEWPEC to provide experts with standardized checklist for educational materials development and evaluation.

The analysis of reliability of feedback domains, indicated internal consistency for booklet and pamphlet as Cronbach α and the average of raters' scores ICC indicted good agreement level for all feedback domains of the designed PEMs.

6.Strengths and limitations

The researchers collected the study data using face-to-face interviews with clients attending the health care settings. Thereby, it was not restricted to only those with internet access, and consequently represent an accurate reflection of low health literacy population from different settings. Moreover, the Delphi method has served a valuable purpose for expert consultation for designing effective PEMs.

The sample included a mix of professional experts and academic staff of varying experience. In addition to health educators and low health literacy population from various primary health care settings and age groups. PEMs design represents the participants' preferences.

However, this study has some limitations. Part of this study was being conducted through face-to-face focus groups. This situation during Corona virus was very hard to descide appointment with participants, using distance barriars and masks compared to online-based survey.

7.Conclusion and Recommendations

The current study concluded that the low health literacy population preferred clear, simple and concise content which suitable to their age, level of education and culture of the designed PEMs about healthy habits regarding Covid-19. The designed booklet and pamphlet were complemented with consistency of low health literacy population preferences and consensus from PEMs users and professional experts. There is significant positive correlations between scores of each domain of "feedback" assessment and its overall quality scores' evaluation of the designed booklet and pamphlet, that implied consistent validity of the quality score of the designed PEMs.

Based on the findings and conclusions drawn from the present study, the researchers recommended that:

1. Dissemination of the designed PEMs for the health educators at the health care settings to use with low health literacy population about healthy behaviors related to Coronavirus .

2. Testing the external validity of the designed booklet and pamphlet.

3. Using the outline of the designing booklet and pamphlet to design other materials for health education.

8.Acknowledgments

9.Funding

10.Conflicts of interest

The authors declare that they have no conflict of interest

11.References

Ab Latif, R., Dahlan, A., Mulud, Z. A., & Nor, M. Z. M. (2017). The Delphi technique as a method to obtain consensus in health care education research. *Education in Medicine Journal,* 9(3).

Abrams, M. A., Kurtz-Rossi, S., Riffenburgh, A., & Savage, B. A. (2016). Building health literate organizations: A Guidebook to achieving organizational change. *Journal of Research and Practice for Adult Literacy, Secondary, and Basic Education, 69.*

Agencia de Union Europea. (2020). Rapid Risk Assessment: Outbreak of acute respiratory syndrome associated with a novel coronavirus, Wuhan, China: First Update. In *Evaluación de riesgos* (Vol. 00, Issue January, pp. 1–12). ECDC Stockholm. https://www.ecdc.europa.eu/en/pu lications-data/risk-assessment outbreak-acute-respiratory syndrome-associated-novel coronavirus

Alahdal, H., Basingab, F., & Alotaibi, R. (2020). An analytical study on the awareness, attitude and practice during the COVID-19 pandemic in Riyadh, Saudi Arabia. *Journal of infection and public health, 13*(10), 1446-1452.

Baloch, S., Baloch, M. A., Zheng, T., & Pei, X. (2020). The coronavirus disease 2019 (COVID-19) pandemic. *The Tohoku journal of experimental medicine, 250*(4), 271-278.

Berhanu, L., Berihun, G., Walle, Z., Teshome, D., Gizeyatu, A., Abebe, M., Hassen, S., Ademas, A., Wagaye, B., & Adane, M. (2021). COVID-19 Prevention Practices and Associated Factors Among Farmers in Peri-Urban Areas of Northeastern Ethiopia. *Journal of Multidisciplinary Healthcare, 14,* 1843.

Berinsky, A. J. (2006). American public opinion in the 1930s and 1940s: The analysis of quota-controlled sample survey data. *International Journal of Public Opinion Quarterly, 70*(4), 499-529.

Boyde, M., & Peters, R. (2014). Education material for heart failure patients: what works and what does not?. *Current heart failure reports, 11,* 314-320.

Center for Disease Control and Prevention (CDC). (2020). Epidemic Update and Risk Assessment of 2019 Novel Coronavirus.

Doung-Ngern, P., Suphanchaimat, R., Panjangampatthana, A., Janekrongtham, C., Ruampoom, D., Daochaeng, N., Eungkanit, N., Pisitpayat, N., Srisong, N., & Yasopa, O. (2020). Case-control study of use of personal protective measures and risk for SARS-CoV 2 infection, Thailand. *Emerging Infectious Diseases, 26*(11), 2607.

Dti. (2016). Focus Group Discussion [PDF]. https://www.herd.org.np/uploads/frontend/Publications/PublicationsAttachments1/1485497050-Focus%20Group%20Discussion_0.pdf

Fakhira, A. D., Pawitra, A. S., Diyanah, K. C., Wikurendra, E. A., Nagy, I., & Abdeljawad, N. S. M. (2021). Awareness of doing 3M (wearing mask, physical distancing, washing hands) during pandemic era in rural and urban families. *Jurnal Kesehatan Lingkungan, 13*(2), 94–101.

Ferdous, M. Z., Islam, M. S., Sikder, M. T., Mosaddek, A. S. M., Zegarra-Valdivia, J. A., & Gozal, D. (2020). Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An onlinebased cross-sectional study. *PLoS ONE, 15(10 October),* 1–17. https://doi.org/10.1371/journal.pone.0239254

Firouzbakht, M., Omidvar, S., Firouzbakht, S., & Asadi-Amoli, A. (2021). COVID-19 preventive behaviors and influencing factors in the Iranian population; a web-based survey. *BMC Public Health, 21*(1), 1–7.

Grudniewicz, A., Kealy, R., Rodseth, R. N., Hamid, J., Rudoler, D., & Straus, S. E. (2015). What is the effectiveness of printed educational materials on primary care physician knowledge, behaviour, and patient outcomes: A systematic review and meta-analyses. Implementation Science, 10(1). https://doi.org/10.1186/s13012-015-0347-5

Haji, A. (2019). Patients' utilisation and perception of the quality of printed health education materials in primary health care: a cross-sectional study. *BJGP Open, 3*(4).

Heyne, R. E. (2017). A Concurrent Validity Study of the Subject Matter Expert Written Patient Education Checklist (SMEWPEC). Capella University.

Hickey, K. T., Creber, R. M. M., Reading, M., Sciacca, R. R., Riga, T. C., Frulla, A. P., & Casida, J. M. (2018). Low health literacy: Implications for managing cardiac patients in practice. *The Nurse Practitioner, 43*(8), 49.

Hung, Y.-L., & Stones, C. (2014). Visual Design in Healthcare for Low-Literate Users–A Case Study of Healthcare Leaflets for New Immigrants in Taiwan. *International Conference of Design, User Experience, and Usability, 44–55.*

Jaarsma, T., Larsen, T., & Strömberg, A. (2013). Practical guide on home health in heart failure patients. *International Journal of Integrated Care, 13.*

JAYA, A. D. N. (2018). DESIGNING A BOOKLET OF FOUR WATERFALLS IN PAGARALAM. POLITEKNIK NEGERI SRIWIJAYA.

Jia, Y., Ma, S., Bai, L., Xiao, Q., Wu, Y., Gao, Y., Han, Y., Xie, Z., Tang, X., & Ge, J. (2021). Health Literacy and Disparities in Knowledge, Attitude and Practice Regarding COVID-19 Among College Students During the COVID-19 Outbreak in China: A Cross-Sectional Study. *Risk Management and Healthcare Policy, 14,* 4477–4488.

Kastner, M., Estey, E., Hayden, L., Chatterjee, A., Grudniewicz, A., Graham, I. D., & Bhattacharyya, O. (2014). The development of a guideline implementability tool (GUIDE-IT): a qualitative study of

family physician perspectives. *BMC Family Practice, 15*(1), 1–22.

Kealey, M. R. C. (2015). Impact of design expertise and methodologies on the usability of printed education materials. University of Toronto (Canada).

McKenzie, J. F., Neiger, B. L., & Thackeray, R. (2009). Planning, implementing, and evaluating health promotion programs: A primer. Pearson/Benjamin Cummings San Francisco, CA.

Moubarak, M., Kasozi, K. I., Hetta, H. F., Shaheen, H. M., Rauf, A., Al-Kuraishy, H. M., ... & Batiha, G. E. S. (2021). The rise of SARS-CoV-2 variants and the role of convalescent plasma therapy for management of infections. *Life, 11*(8), 734.

Nasrullah, M. (2019). DESIGNING A BOOKLET OF SONGKET CRAFT CENTER IN PALEMBANG. POLITEKNIK NEGERI SRIWIJAYA.

Persai, D., Panda, R., & Kumar, R. (2016). A Delphi study for setting up tobacco research and practice network in India. *Tobacco induced diseases, 14*(1), 1-7.

Pizano, M. M. (2016). Evaluation of Printed Health Education Materials for Readability and Suitability for Older Adults. California State University, *Long Beach.*

Richards, J. C. (2001). Curriculum development in language teaching. Cambridge university press.

Shariff, N. (2015). Utilizing the Delphi survey approach: *A review. J Nurs Care, 4*(3), 246.

Shoemaker, S. J., Wolf, M. S., & Brach, C. (2014). Development of the Patient Education Materials Assessment Tool (PEMAT): a new measure of understandability and actionability for print and audiovisual patient information. *Patient Education and Counseling, 96*(3), 395–403.

SINTYA, M. (2019). DESIGNING A BOOKLET TO PROMOTE SOUVENIR FROM PALEMBANG. POLITEKNIK NEGERI SRIWIJAYA.

Somani, N., Beukes, E., Latham, K., Andersson, G., & Allen, P. M. (2021). Designing an internet‑based intervention for improving wellbeing in people with acquired vision loss: A Delphi consensus study. Ophthalmic and Physiological Optics, 41(5), 971-984.

Tadesse, T., Alemu, T., Amogne, G., Endazenaw, G., & Mamo, E. (2020). Predictors of Coronavirus Disease 2019 (COVID-19) prevention practices using health belief model among employees in Addis Ababa, Ethiopia, 2020. *Infection and Drug Resistance, 13*, 3751.

Wang, W., Tang, J., & Wei, F. (2020). Updated understanding of the outbreak of 2019 novel coronavirus (2019-nCoV) in Wuhan, China. *Journal of Medical Virology, 92*(4), 441–447. https://doi.org/10.1002/jmv.25689

Zhong, B.-L., Luo, W., Li, H.-M., Zhang, Q.-Q., Liu, X.-G., Li, W.-T., & Li, Y. (2020). Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *International Journal of Biological Sciences, 16*(10), 1745