Behavior-based Exposure to Droplet Infection: Development and Validation of a Self-risk Measurement Tool During the COVID-19 Pandemic

Sherif Nesnawy; Ph.D* [(1)], Lobna M. Gamal; Ph.D [(2)], Ahmed Arafa; MD[(3)], Mostafa Abdel Kader; Ph.D[(4)], Manar D. Mohammed; Ph.D [(5)] Basiony M. Basiony; Ph.D [(6)], Aml S. Abdelbaky; Ph.D [(7)],Sahar H. Taha; Ph.D [(1)]

(1) Lecturer of Adult Medical-surgical Nursing, Faculty of Nursing, Minia University, Minia, Egypt.
(2) Assistant Professor of Critical Care Nursing, Faculty of Nursing, Minia University, Minia, Egypt.
(3) Assistant Lecturer of Public Health, Faculty of Medicine, Beni-Seuf University, Beni-Suef, Egypt.
(4) Professor of Radio-diagnosis, Department of Radiology, Faculty of Medicine, Minia University, Minia, Egypt.
(5) Lecturer of Community Health Nursing, Faculty of Nursing- Minia University, Minia, Egypt
(6) Lecturer of Nursing Administration, Faculty of Nursing, Beni-Seuf University, Beni-Suef, Egypt.
(7) Lecturer of Geriatric Care Nursing, Faculty of Nursing, Minia University, Minia, Egypt.

ABSTRACT

Background: The individual Behavior-based vulnerability to COVID-19 imposes risk of underestimation without objective evaluation. This study aimed to develop a tool for behavior-based risk of exposure to droplet infection (REDI) during COVID-19 pandemic. **Methods:** Initial REDI was developed with four domains (precautions for direct droplet infection, precautions for indirect droplet infection, precautions in a shared shelter, and precaution in health facilities), then validated through an online cross-sectional study among 608 non-health facilities' workers/clients (NHF), 201 clients in health facilities during last month (CIHF), and 386 workers in health facilities (WIHF). **Results:** The final model confirmatory factor analysis indicated a good fit of the model [$\chi 2$/df = (1.45-1.86), GFI= (0.90-0.96), CFI= (0.89-0.96), RMSEA = (0.036-0.048)] among NHF, CIHF, and WIHF with Cronbach's values 0.82, 0.80, and 0.87, respectively. Perceived/measured REDI was 0.28/0.66 (±0.20/0.22) in 72.2% of participants. **Conclusion:** REDI tool is valid and reliable for COVID-19 behavior-based risk identification.

Keywords: COVID-19; Confirmatory factor analysis; Infection precaution; Risk of exposure to droplet infection; Tool development.

Email: shriefsayed@mu.edu.eg

Introduction

The coronavirus disease 2019 (COVID-19) has become the priority of the global health agenda in 2020. COVID-19 first emerged as a respiratory-infectious epidemic in Wuhan, China, in December 2019 **(Tian et al., 2020)**. At lightning speed, within 3 months, COVID-19 had spread to more than 114 countries, recording more than 18,000 cases and killed more than 4,000 people. Consequently, WHO declared COVID-19 a pandemic on March 11, 2020 **(WHO, 2020a)**. Till the time of writing this paper, the global number of cases and deaths of COVID-19 are increasing; the latest number of infected people exceeds 4.7 million with the number of mortalities over 316,000 **(WHO, 2020b)**. Although the global society has previously treated with global health emergencies including Ebola virus in 2014, Swine Flu in 2009, and SARS in 2003, the battel against novel Coronavirus (COVID-19) has yet shown that the global society is not fully armed to face such health emergency outbreak. COVID-19 pandemic is a public health emergency and humanitarian challenge; COVID-19 has affected not only health but also the economic and geopolitical aspects.

Asepsis is fundamental even if either is there a vaccine for COVID-19 or confirmed treatment; those are not substituting. The meticulous adherence to the "precautionary principle" in epidemiology is the best solution for the individual to decrease the chance of exposure to infection. If one of the preventive measures is left out, the risk of infection is still present **(Baral et al., 2020; Machida et al., 2020)**. Despite the potentially harmful consequences for individuals and the public health of COVID-19, non-adherence to its control measures was reported.

In the time of widespread use of social

media and fear from pandemic novel disease with unknown treatment, non-adherence could be unintentional when many myths and fake news were falsely adopted as a base for the prevention and management of COVID-19 infection **(Chesser et al., 2020; Pollak et al., 2020)**. For instance, making errors during donning and doffing personal protective equipment (PPE) can easily result in contamination and infection **(Aven & Bouder, 2020)**. Furthermore, to change health behavior, providing information is not enough: the primary motives to maximize the adherence to a new health behaviour is the individual's awareness of the degree of threat severity on his/her life **(Yamamoto & Bauer, 2020)** and to how much being susceptible to get the risk **(Jose et al., 2020)**. As the perceived risk is a subjective estimation **(Lifshitz et al., 2016)**, both underestimation of actual threat and therefore inappropriate degree of defensive behaviour can occur.Hence, the development of a tool by which people can correctly identify and reform their errors and deficits in precautionary behaviors during the COVID-19 pandemic is of great importance.

For the evaluation of the COVID-19 threat, there are various tools in the form of online surveys or mobile applications were developed and are in-use. Most of these tools focus on the existing hazard communication by either tracking the affected cases or diagnosing a probable risk of the respondents based on the provided health information **(Chatterjee et al., 2020)**. To enhance COVID-19 protective behavior, information has been disseminated over the world through various official platforms. Notably, the self-evaluation of COVID-19 protective behavior didn't get enough heed.

Based on the available evidence, COVID-19 can be transmitted by direct respiratory droplets and indirect droplets presented on surfaces, person-to-person contact, and probably airborne routes **(MacIntyre & Chughtai, 2020)**. Accordingly, the individual risk of exposure to droplet infection during COVID-19 could be comprehensively evaluated through the followed precautionary behavior for direct droplet infection (e.g. maintaining social distancing and wearing a face mask) and indirect droplet infection (e.g. frequent hand washing hands with soap or alcohol, using diluted cholerine and soap, or exposing the items to heat, and avoiding touching eyes, nose, and mouth with unwashed hand or items) **(WHO, 2020e)**.

Importantly, there are two additional specific groups of precautions that should be adopted. The first one is related to people in a shared shelter; they should consider the area between the entrance and the living space as a "buffer zone" in which they can get rid of probable viral contamination in their outerwear, shoes, and any other items. The second one is to the persons who deal with a medical facility by either working in or using it. Health care facilities have to adopt internal administrative policies to be followed by their staff and users to prevent cross-contamination **(WHO, 2020c)**. Patients attending outpatient or inpatient departments are at risk if they or their health care providers are not adherents to such rules **(2020c; Yang et al., 2020)**. These regulations should be more specified for hot areas (e.g. emergency triage, radiology department), procedures (e.g. tracheal intubation and respiratory aerosols), and interdepartmental communication **(Mostaghimi et al., 2020; Noble et al., 2020; Pichi et al., 2020; Samiee et al., 2020)**.

Aim of the Study

The present study aimed to develop a comprehensive simple self-evaluative tool for the behavior-based risk of exposure to droplet infection (REDI) among non-health facilities' workers/clients (NHF), clients in health facilities during last month (CIHF), and workers in health facilities (WIHF) during the time of the COVID-19 pandemic.

Methodology of Tool Development

Target population: The tool is designed to utilized in a broad range of age (adult and geriatric), and population categories (NHF, CIHF, and WIHF). The age started from 16 years old.

Sample size: For factorial analysis, there is no shortage of recommendations the suggested minimums for sample size include from 3 to 20 times the number of variables and it is

preferred to be of 6 times **(Mundfrom et al., 2005)**.

As the first version of the tool consisted of 30, 38, and 42 items for NHF, CIHF, and WIHF categories, the minimum required sample size were collected by multiplying the number of variables to 6 with sample sizes at 180, 228, and 252, respectively. However, the collected samples exceeded that numbers.

Study design: cross-sectional research design.

The tool was developed through 4 stages:

Stage1. Items formation and selection

The first version of the tool was developed after an in-depth review of COVID-19 related protective precautions in health facilities and the general community as recommended by WHO and the results of related published evidence. We created the items of the REDI tool based on the knowledge, behavior, and practice conceptualization, with four sub-concepts: 1) precautions to the direct droplet infection, 2) precautions to the indirect droplet infection, 3) precautions in a shared shelter, and 4) precautions in health facilities that targeted CIHF (either in inpatient or outpatient units) or WIHF (either medical or non-medical staff). Accordingly, the tool was designed differently according to three categories of people; NHF, CIHF, and WIHF. The initial version of the tool consisted of 30, 38, and 42 items for NHF, CIHF, and WIHF categories, respectively.

Understanding and Legibility among the age range of 16 years old to the geriatrics either for public or for those who were in contact with any health facility (clients, medical-surgical staff, critical care practitioners) in a month prior to the study. For health care workers, the indicative items related to emergency triage, inpatient precautions and the recommended administrative rules in health care services were carefully stated.

As a self-evaluative tool, the questions were answered on a true/false basis with an additional "Not sure" option. The correct answer coded as "zero" item risk and the incorrect one encoded "one" for risk, with higher scores indicating higher REDI.

Stage2. Content validity

In terms of content validity, a panel of 5 experts in medical and nursing education was asked to individually evaluate the preliminary tool items for appropriateness, representativeness, and explicitness using a three-point Likert scale (1 to 3): 1= should be deleted, 2= relevant but an adjustment is required, and 3= relevant, clear, and precise. Some experts advised us to collect some items into one. Items with a mean score of less than two were deleted resulting in 20, 25, and 32 items for NHF, CIHF, and WIHF categories, respectively (second version of REDI tool).

Stage3. Data collection

This was a cross-sectional study conducted online over 40 days (from 11 April to 21 May 2020) because of the difficulty to collect data by interviewing people during the COVID-19 pandemic.

The samples were of snow-ball type; relying on social media platforms, the invitation to participate in the study was posted/reposted to Facebook groups. The authors searched for and posted the invitation in social groups containing words like "youth, help, medical, Nurse, doctors, hospital, clinic, medical consultation". This poster contained a brief introduction about the objective, procedures, voluntary choice of participation, declarations of confidentiality, and notes for filling in the tool, as well as the link of the online tool for each tool category. In the same poster, there was a special link for each group category to enable every participant to fill the related tool form. Persons who were aged 16 years or more, could read in Arabic, and agreed upon the posted invitation to participate in the study were instructed to fill in the tool according to his/her category via clicking the link. The online tool form permitted the participant to view his/her incorrect answer with a commentary brief paragraph for the items that require justifications or knowledge. Eventually, a convenience sample of 1,195 participants was recruited (608, 201, and 386 for NHF, CIHF, and WIHF, respectively). Men and women were nearly equally represented; 47.6% were male. The age of participants ranged from 16 to 71 years old (34.6± 10.5). About 71.9 % of participants reported

university education or higher (Table 1). In the WIHF group, the participants from nursing and medical staff accounted for 61.4 % and 16.8 %, respectively. The subjectively perceived self-risk of exposure to droplet infection were requested in percentage from the respondents with a question: "Based on your protective behaviors against COVID- 19 infection, to what extent do you perceive yourself safe from exposure to infection?". However, it was reported from only 863 (72.2%) in all participants.

Stage4. Factorial validity, internal consistency, and reliability:

Factorial validity was investigated by using the confirmatory factor analysis (CFA) for each tool of each category separately. At first, CFA was conducted and items that yielded a factor loading value less than 0.4 were eliminated from the tool unless there was a theoretical significance. After that, the goodness of fit for the REDI tool of each population category was testified. The goodness of fit of each model to its data was determined using multiple indicators. The model was fit if the goodness of fit index (GFI) > 0.850, the adjusted GFI (AGFI) > 0.800, and the root-mean-square residual (RMSR) <0.050. To examine the internal reliability, inter-subscales correlations were obtained with Cronbach's alpha coefficient. The SPSS Version 21.0 statistical software was used for the descriptive analysis, goodness of fit analysis, and Cronbach's alpha reliability tests while the CFA was conducted using AMOS 20.0 statistical software.

Results and Discussion:

Confirmatory factor analyses were conducted for the second version of the REDI tool of each category to evaluate items' loading values for deletion. All items loading > 0.40 were maintained in addition to three items in NHF category (loading from 0.35 to 0.38) (Figure 1), eight items in CIHF population (loading from 0.31 to 0.38) (Figure 2), and nine items in WIHF category (loading from 0.31 to 0.38) (Figure 3). The resulting tool consisted of 16 items distributed across three domains: precautions for direct droplet infection (6items), precautions for indirect droplet infection (5 items), and precaution in a shared shelter (5 items) for the NHF population. The same items and domains were included for the other population categories with an additional fourth domain for precaution in health facilities which contained four and nine items for CIHF and WIHF, respectively (Table 2).

Confirmatory factor analyses represented a good fit to the model as indicated by RMSEA, the RMS (standardized residual), GFI, AGFI, Non-Normed Fit Index (NNFI), and Normed Fit Index (NFI). The X^2 values for the three models of the three categories remained significant, probably due to the effect of large sample size and small discrepancies (Table 3).

The correlation coefficients among the latent variables (domains) ranged from 0.35 to 0.72 in the NHF group (three domains), 0.35 to 0.72 in the CIHF group (four domains), and 0.33 to 0.78 in the WIHF group (four domains). The error variances of the items in NHF (Figures 1), CIHF (Figures 2), and WIHF (Figures 3) were (0.75 to 0.96), (0.52 to 0.91), and (0.60 to 0.96), respectively. There is no negative error variance or large error variances appeared. Regarding the internal consistency, the value of Cronbach's a for the REDI tool in the NHF category (N = 608) was 0.82 while it was 0.80 in the CIHF category (N=201) and 0.87 in the WIHF category (N=386).

Subjective perceived REDI was reported from 863 (72.2%) participants and it was 0.28±0.20, and 89.5% of them reported that they were frequently exposed to COVID-19 information from official sites. However, the measured REDI for them was 0.66±0.22. Importantly, the reported risk was the highest among NHF (0.31±0.20) whereas the measured REDI scored the highest in CIHF (0.70±0.19) and WHIF (0.69±0.20) (Table 4). These results implied that the utilization of the REDI tool could uncover the masked orunidentified items of risk for COVID-19 infection.

Finally, Domains of (precautions to the direct droplet infection, precautions to the indirect droplet infection, and precautions in a shared shelter) are represented in the first 16 items and to be used NHF population. Population of CIHF and WIHF have the same previous items of the 3 domains with additional fourth domain for precaution in health facilities which included four items for CIHF and nine items for WIHF (Table 5).

Table 1. Basic characteristics of the study participants:

		N	%
Age (years)	< 30	396	33.1%
	30 - < 40	480	40.2%
	40 -< 50	212	17.7%
	50 -< 60	76	6.4%
	≥ 60	31	2.6%
	Mean ± SD	34.6±10.5	
Male		569	47.6%
Level of education	Read & write/primary	41	3.4%
	Secondary	295	24.7%
	University and more	859	71.9%
Taking news from official sites		1070	89.5%
Non-health facilities' workers/clients (NHF)		608	50.9%
Clients in health facilities (CIHF)		201	16.8%
Workers in health facilities (WHF)		386	32.3%

Table 2. Domains and items of the Risk of Exposure to Droplet Infection tool:

	Precautions of direct droplet infection
1.	Everywhere in public: safe social distance
2.	Wear approved face-covering
3.	face-covering: right donning
4.	face-covering: Right doffing
5.	Hand washing after doffing face-covering
6.	Avoid face to face opposition in a shared close unsafe spacePrecautions of indirect droplet infection
7.	Public contact without precautions*
8.	Right handwashing
9.	avoid touching the three (mouth, nose, and eye) with unclean hand/item.
10.	Wash hand after any sharing places or services
11.	Using the recommended killers of virus (temperature or cleansers)Precautions in a shared shelter
12.	Using any ordinary household cleansers to kill the virus*
13.	Buffer zone
14.	Taking off shoes before entering
15.	Taking off the outerwear before touching anything
16.	Hand washing before touching anything at homePrecautions in health facilities for Clients
1.	On entrance: face covering is obligatory.
2.	Starting with measuring body temperature asking about symptoms of infection
3.	The health care providers wear personal protective equipment
4.	Safe social distance
	Precautions in health facilities for health workers
1.	For all (workers and non-workers): face-mask is obligatory inside hospital, as tolerated.
2.	No attendance of workers with fever or respiratory symptoms
3.	Frontline triage-staff on hospital entrance
4.	the interdepartmental contact communication is prohibited
5.	Isolated cases have to wear mask if they are going to go outside the isolation area
6.	Disinfection after any transfer of the infected/suspected cases
7.	Isolation room/area for conduct with the confirmed/suspected COVID-19 cases
8.	Strict protection during procedures possibly associated with respiratory droplets
9.	In-work gathering for food or relaxation*

*item is reversely stated.

Table 3. The goodness of fit statistics for comparative models of the REDI tool across three population categories*

	X^2	df	*P*	CM/DF	RMSEA	RMS	GFI	AGFI	NNFI	NFI	CFI
NHF	174.74	98	<0.001	1.78	0.036	0.01	0.96	0.95	0.91	0.95	0.96
CIHF	229.54	158	<0.001	1.45	0.048	0.01	0.90	0.87	0.73	0.87	0.89
WIHF	513.26	266	<0.001	1.93	0.049	0.01	0.90	0.88	0.81	0.88	0.89

*The model for each category represents factors, correlated factors, and error covariances.

NHF= non-health facilities' workers/clients; CIHF= clients in health facilities; WIHF= workers in health facilities; RMSEA = Root Mean Squared Error of Approximation; RMS = standardized residual, GFI = the Goodness of Fit Index; AGFI = Adjusted Goodness of Fit Index; NNFI = Non-Normed Fit Index; NFI = Normed Fit Index; CFI = Comparative Fit Index.

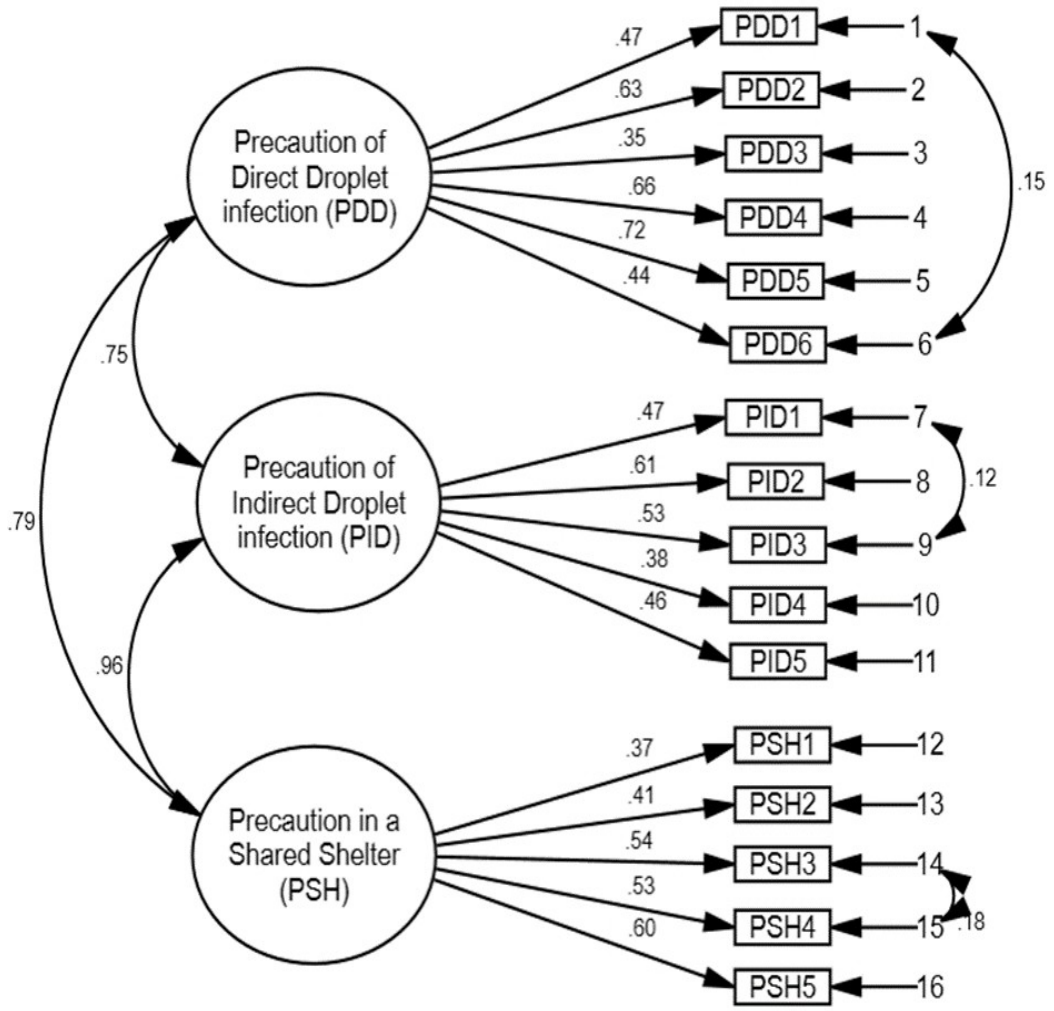

Figure 1: The measurement model of the REDI tool for non-health facilities' workers/clients

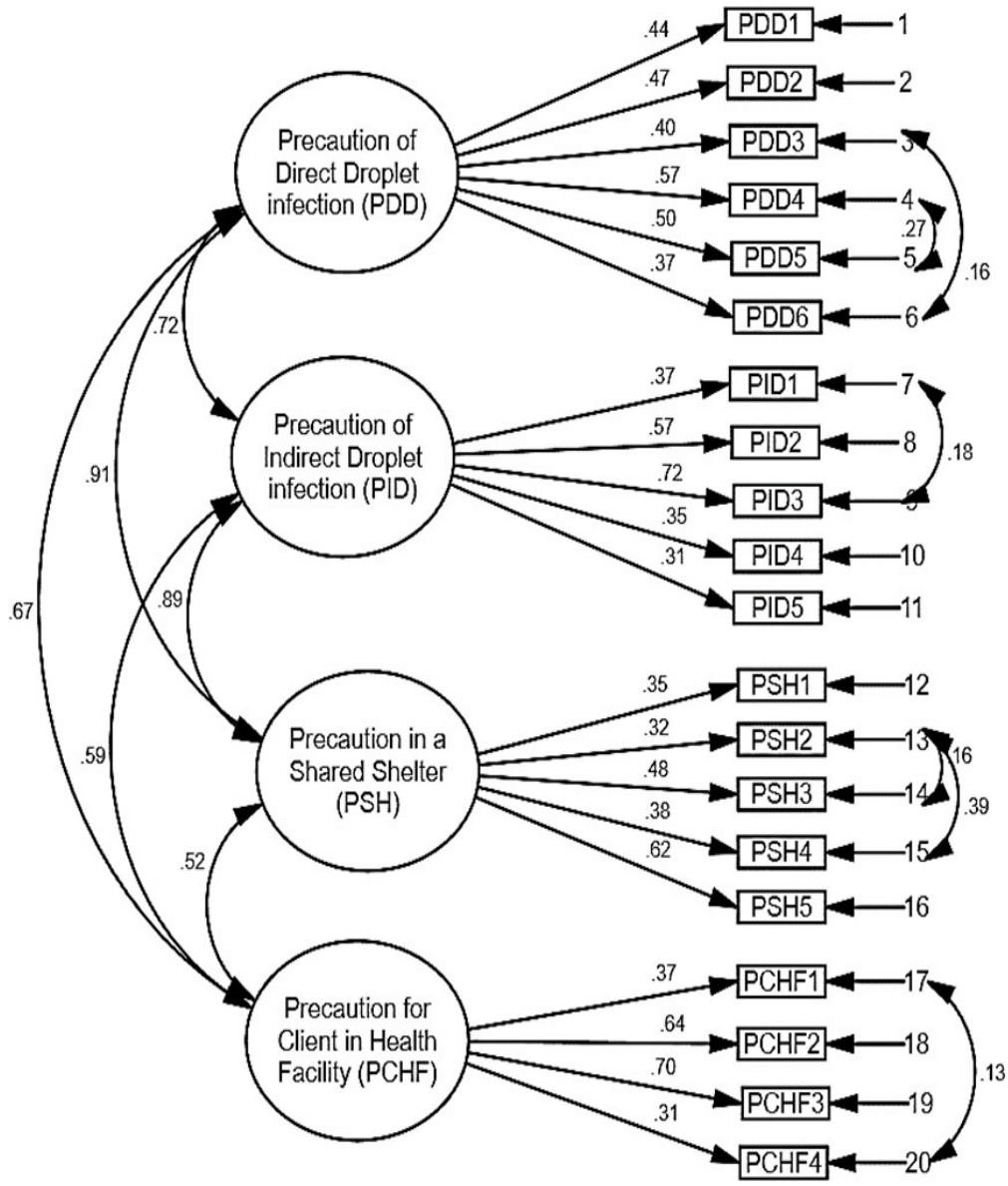

Figure 2: The measurement model of the REDI tool for clients in health facilities

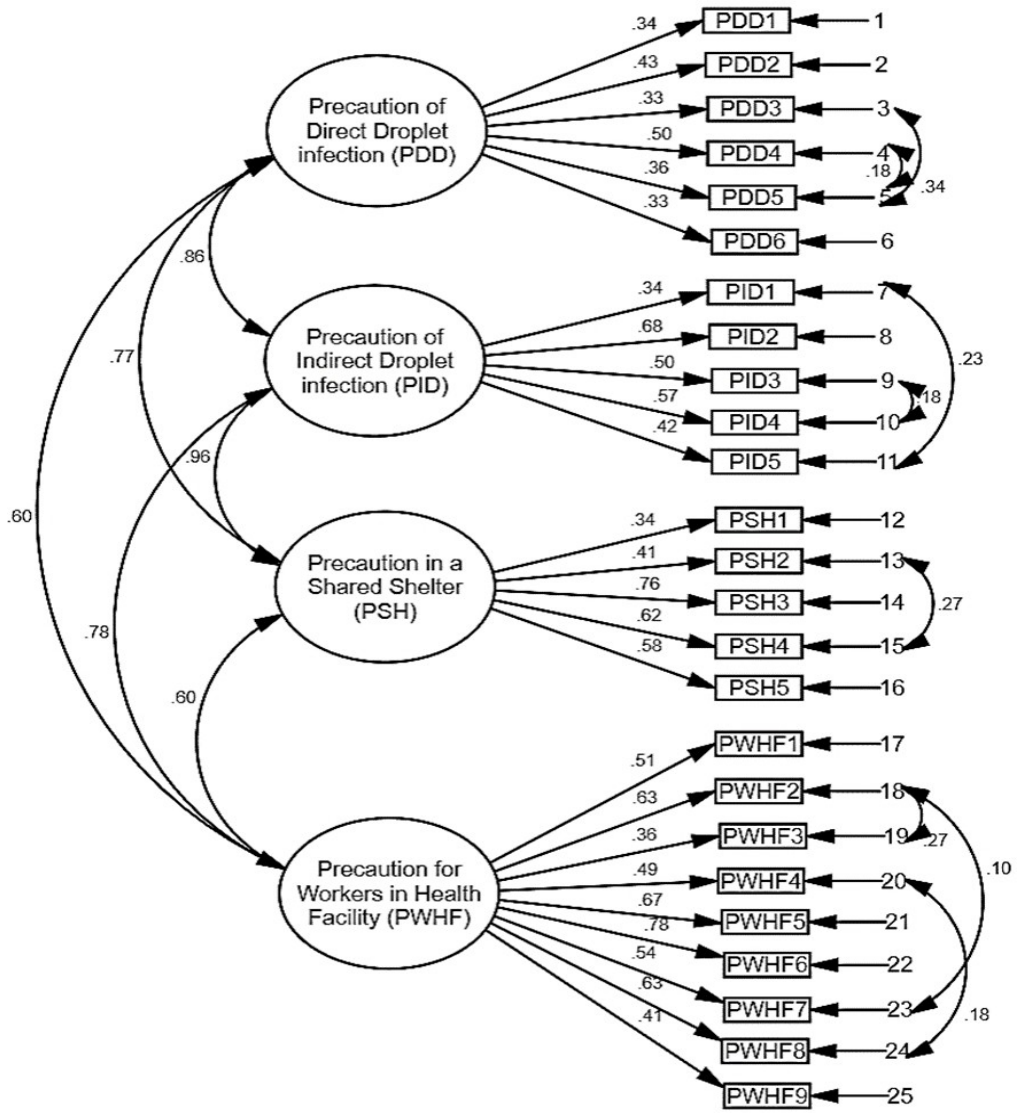

Figure 3: The measurement model of the REDI tool for workers in health facilities

Table 4. Mean percentages of perceived and measured risk of exposure to droplet infection among study participants

	Perceived riskMean ± SD	Measured riskMean ± SD
NHF (N=507)	0.31±0.20	0.64±0.23
CIHF (N=141)	0.29±0.21	0.70±0.19
WIHF (N=215)	0.24±0.15	0.69±0.20
All participants (N= 863)	0.28±0.20	0.66±0.22

NHF= non-health facilities' workers/clients; CIHF= clients in health facilities; WIHF= workers in health facilities.

Table 5. English Version of Behavior-based Risk of Exposure to Droplet Infection Tool during COVID-19 pandemic

Please read each statement and circle the answer that describes your practice during the last month by either yes or no, or not sure.

1. while in public, do you commit to the safe social distance (one meter or more)?
2. Do you wear the approved face-covering type by the trusted health organizations?
3. Do you wear the mask with gaps left around the nose or put it down to the mustache for rest?
4. Do you take off the face mask starting from front of the face to back?
5. Do you wash your hands after taking off the face mask?
6. Do you always keep your face away from the face of others in a shared close unsafe space such as in medical examination or transportation?
7. Do you shake hands with people?
8. Do you include whole hands with friction for 20 seconds when washing them with soap or rubbing them with alcohol?
9. Do you avoid touching your hands or things like the phone to the three (mouth, nose, and eye) before washing or sanitizing it?
10. Do you wash your hands after dealing with anything shared with others either places (such as medical clinics - toilets) or things (such as banknotes – paper files)?
11. Do you use the recommended virus killers such as (soap - diluted chlorine - alcohol 60% - exposure to a temperature of 56 degrees Celsius or higher)?
12. Do you use other household methods to kill the virus, such as using vinegar, or the refrigerator?
13. Do you take a little space in the entrance to your house in which you deal with your belongings by disinfection or disposal before entering the house?
14. Do you take off your shoes before entering the house?
15. Do you gently take off your outerwear before touching anything at home?
16. Do you avoid touching anything at home before washing or disinfecting your hands?

If you visited a health facility for health checkups or hospitalization during the last month, please continue here.

1. Did the medical facility ask you to wear the face mask before entrance?
2. Was your temperature measured and were you asked about any flu-like symptoms before any contact with you?
3. Was the health care provider who dealt with you wearing the personal protective equipment?
4. Did the medical facility commit to the distance between the people (such as the waiting area, the emergency beds, and inpatient beds)

If you worked in a health facility during the last month, please continue here.

1. Does the medical facility / department obligate everyone (workers and patients) to wear a medical mask as soon as it enters (as tolerated)?
2. Did the medical facility prohibit the attendance of any worker with fever or respiratory symptoms?
3. Was there a frontline triage-staff on hospital entrance to find out the suspected COVID-19 cases?
4. Have you replaced face-to-face communication in reports, follow-ups, etc., to be all via phone or messages, unless it is insufficient?
5. In the event that a COVID-19 case goes outside his/her isolation area: Is he/she obligated to wear a medical mask, as tolerated?
6. If a confirmed and suspected COVID-19 case is transferred from one department to another or for an examination such as x-rays: Is disinfection of contact surfaces done immediately afterwards?
7. Did the conduct with COVID-19 cases is done in isolation area?
8. Did you wear the recommended personal protective equipment during procedures possibly associated with respiratory droplets?
9. Did you meet up with your colleagues for food or a little relaxation while in the medical facility?

Conclusion and Recommendation:

To the best of our knowledge, this is the first study to develop and validate a simple individually comprehensive evaluative tool for the REDI during the COVID-19 pandemic. Our work resulted in three population-specific self-evaluative tool-categories; the first 16 items (three domains) for all populations with an additional fourth domain for precaution in health facilities which included four items for CIHF and nine items for WIHF (Table 5). The final evaluation of the tool showed good content validity and reliability by a cross-sectional online-based study.

Practical Use of the REDI tool:

This tool is primarily developed for a comprehensive evaluation of personal and interdependent preventive behavior against the REDI of COVID-19. Still, it can be used for the educative and behavior reforming method as it may alarm the person of his/her wrong practices or precaution's deficiency. Further, the REDI tool emphasizes the interdependent role of COVID-19precautions' adherence to health facilities. The tool can be also utilized for other respiratory epidemic diseases transmitted by direct and indirect droplet infection. We suggest that the REDI tool can be easily distributed through online surveys or phone applications everywhere to help people evaluate and reform their behavior to prevent infection. To be used in another context, the tool needs further validation in groups speaking other languages and in other cultures. This tool can be also utilized by all health care workers and especially by nurses from all categories (e.g. medical-surgical, geriatric, community, administration) as an evaluative and educational measure either in public or in health care facilities.

Study strengths and limitations:

Of note, this study included some limitations that should be addressed. First, participants were recruited from people using internet social media; the pros and cons of using online surveys were described elsewhere **(Arafa et al., 2019)**. Although our sample could be well-representative for NHF, CIHF, and WIHF regarding their sociodemographic characteristics, the possibility of selection bias cannot be excluded. Despite these limitations, this study was conducted during a phase of ongoing progressive increase of cases and deaths related to the COVID-19 pandemic, thus, it can uncover errors and deficits in protective behaviors.

Declaration of competing interests:

None.

Funding:

The authors received no financial support for this study, authorship, and/or publication of this article.

Ethics:

This study is developed from the research project titled "Developing a strategy and evaluative tool for prevention of COVID-19" which approved by the Research Ethics Committee of the Faculty of Nursing [Approval No: 120/29-4-2020], Beni seuf University, Egypt.

Acknowledgments

The authors gratefully acknowledge all the medical and non-medical personnel fighting COVID-19 at each level.

Author contributions:

Sherif Nesnawy: Conceptualization, Methodology, data analysis, and Writing-Original draft preparation of manuscript. Ahmed Arafa: Writing- Reviewing and Editing. All authors: contributed to data collection and seriously revised the final version of the manuscript. Tool is totally reserved to Sherif Nesnawy.

References

Arafa, A., Anzengruber, F., Mostafa, A., & Navarini, A. (2019). Perspectives of online surveys in dermatology. *Journal of the European academy of dermatology and venereology, 33*(3), 511-520.

Aven, T., & Bouder, F. (2020). The COVID-19 pandemic: how can risk science help? *Journal of Risk Research*, 1-6. doi:https://doi.org/10.1080/13669877.2020.1756383

Baral, S. D., Mishra, S., Diouf, D., Phanuphak, N., & Dowdy, D. (2020). The public health response to COVID-19: balancing precaution and unintended consequences. *Annals of Epidemiology*. doi: 10.1016/j.annepidem.2020.05.001

Chatterjee, R., Bajwa, S., Dwivedi, D., Kanji, R., Ahammed, M., & Shaw, R. (2020). COVID-19 Risk Assessment Tool: Dual application of risk communication and risk governance. *Progress in Disaster Science*. doi: http://dx.doi.org/10.1016/j.pdisas.2020.100109

Chesser, A., Drassen Ham, A., & Keene Woods, N. (2020). Assessment of

Jose, R., Narendran, M., Bindu, A., Beevi, N., Manju, L., & Benny, P. (2020). Public perception and preparedness for the pandemic COVID 19: A Health Belief Model approach. *Clinical Epidemiologyand Global Health*. doi: https://doi.org/10.1016/j.cegh.2020.06.009

Lifshitz, R., Nimrod, G., & Bachner, Y. G. (2016). Measuring risk perception in later life: The perceived risk scale. *Journal of the American Psychiatric Nurses Association, 22*(6), 469-474. doi: 10.1177/1078390316659910

Machida, M., Nakamura, I., Saito, R., Nakaya, T., Hanibuchi, T., Takamiya, T., . . . Kojima, T. (2020). Adoption of personal protective measures by ordinary citizens during the COVID-19 outbreak in Japan. *International Journal of Infectious Diseases*. doi: https://doi.org/10.1016/j.ijid.2020.04.014

MacIntyre, C. R., & Chughtai, A. A. (2020). A rapid systematic review of the efficacy of face masks and respirators against coronaviruses and other respiratory transmissible viruses for the community, healthcare workers and sick patients. *International Journal of Nursing Studies*. doi: https://doi.org/10.1016/j.ijnurstu.2020.103629

Mostaghimi, A., Antonini, M.-J., Plana, D., Anderson, P. D., Beller, B., Boyer, E. W., . . . Sinha, M. S. (2020). Regulatory and safety considerations in deploying a locally fabricated, reusable, face shield in a hospital responding to the COVID-19 pandemic. *Med*. doi: https://doi.org/10.1016/j.medj.2020.06.003

Mundfrom, D. J., Shaw, D. G., & Ke, T. L. (2005). Minimum sample size recommendations for conducting factor analyses. *International Journal of Testing, 5*(2), 159-168.

Noble, J., Degesys, N. F., Kwan, E., Grom, E., Brown, C., Fahimi, J., & Raven, M. (2020). Emergency department preparation for COVID-19: accelerated care units. *Emergency Medicine Journal*. doi: http://dx.doi.org/10.1136/emermed-2020-209788

Pichi, B., Mazzola, F., Bonsembiante, A., Petruzzi, G., Zocchi, J., Moretto, S., . . . Pellini, R. (2020). CORONA-steps for tracheotomy in COVID-19 patients: A staff-safe method for airway management. *Oral oncology, 105*. doi: 10.1016/j.oraloncology.2020.104682

Pollak, Y., Dayan, H., Shoham, R., & Berger, I. (2020). Predictors of adherence to public health instructions during the COVID-19 pandemic. *Psychiatry and clinical neurosciences*. doi: 10.1111/pcn.13122

Samiee, S., Hadjilooei, F., Alamolhoda, M., & Akhlaghpoor, S. (2020). New policy and regulation for a Radiology-Oncology Center at the time of Covid-19 outbreak in Tehran-Iran. *Advances in Radiation Oncology*. doi: 10.1016/j.adro.2020.04.005

Tian, S., Hu, N., Lou, J., Chen, K., Kang, X., Xiang, Z., . . . Liu, D. (2020). Characteristics of COVID-19 infection in Beijing. *Journal of Infection*. doi: https://doi.org/10.1016/j.jinf.2020.02.018

WHO. (2020a). Coronavirus disease 2019 (COVID-19) Situation Report –51. Available at: https://www. who. int/ docs/ default- source/ coronaviruse/ situation- reports/ 20200311- sitrep-51-covid-19. pdf? sfvrsn= 1ba62e57_10

WHO. (2020b). Coronavirus disease 2019 (COVID-19) Situation Report– 120 update-19 May 2020. Available at: https:// reliefweb. int/sites/ reliefweb.int/files/resources/20200519-covid-19-sitrep-120.pdf

WHO. (2020c). Infection prevention and control during health care when COVID-
19 is suspected: interim guidance, 19 March. Available at: https://apps.who.int/iris/bitstream/handle/ 10665/331495/WHO-2019-nCoV-IPC- 2020.3-eng.pdf

WHO. (2020d). Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations: scientific brief, 27 March. Available at: [https://apps.who.int/iris/bitstream/handle /10665/331601/WHO-2019-nCoV-

WHO. (2020e). Responding to community spread of COVID-19: interim guidance, 7March. Available at: https://apps.who.int/iris/bitstream/handle/ 10665/331421/WHO-COVID-19-

Yamamoto, N., & Bauer, G. (2020). Apparent difference in fatalities between Central Europe and East Asia due to SARS-COV-2 and COVID-19: Four hypotheses for possible explanation. *Medical hypotheses, 144*, 110160. doi: https:// doi. org/ 10. 1016/j.mehy.2020.110160

Yang, C.-J., Chen, T.-C., & Chen, Y.-H. (2020). The preventive strategies of community hospital in the battle of fighting pandemic COVID-19 in Taiwan. *Journal of Microbiology, Immunology, and Infection, 53*(3), 381. doi: 10.1016/j.jmii.2020.03.019