INTERNATIONAL JOURNAL OF RESEARCH AND INNOVATION IN SOCIAL SCIENCE (IJRISS)
ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |

The Factor Structure of the Breast Cancer Screening Beliefs Questionnaire among Female Employees in Zambia: The Case of Lusaka District

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DOI: https://dx.doi.org/10.47772/IJRISS.2023.7684

Received: 18 May 2023; Revised: 07 June 2023; Accepted: 09 June 2023; Published: 10 July 2023

ABSTRACT

In Zambia, breast cancer has become one of the leading causes of death among women with the mortality rate of 8.5 deaths per 100 000 (Bray, Farlay, Soerjomataram, Siegel, Torre & Jemal as cited in Cabanes, Kapambwe, Citonge-Msadabwe, Parham, Lishimpi, Cruz & Shastri, 2019). Delays in symptom recognition and diagnosis among women are associated with high mortality rate. The breast cancer screening beliefs questionnaire (BCSBQ) is widely utilised for measuring women's attitude, knowledge and perception concerning breast cancer and screening practices. However the psychometric properties of this instrument have not been established on a Zambian sample. This study therefore aimed at investigating the reliability and construct validity of the BCSBQ on a Zambian sample. The 12-item BCSBQ with three subscales was administered to a non-probability sample of 201 Zambian female employees. The factorial structure models underlying the BCSBQ were investigated using item analysis, exploratory factor analysis (EFA) as well as the confirmatory factor analysis (CFA) via structural equation modelling. Statistical analyses provided good fit of the BCSBQ measurement model with the empirical data. Conclusion: This study has demonstrated evidence of construct validity for the usage of the BCSBQ in the Zambian context. These findings therefore clear the way to investigate the predictive validity of the instrument when used by human resources practitioners for health screening purposes. A reliable and valid instrument as shown by the results is important for the development of breast cancer screening and prevention programmes

Keywords: Breast Cancer

INTRODUCTION

Breast Cancer is one of the ailments that heavily affect employee wellbeing and leading cause of death. More than 500 000 women die of breast cancer annually in the world (Songiso, Pinder, Munalula, Cabanes, Rayne, Kapambwe, Shibemba & Parham, 2020). In Zambia, incidences of breast cancer are estimated to be at 19.9 cases per 100,000 with the mortality rate at 8.5 deaths per 100,000 (Bray et al., as cited in Cabanes et al., 2019). According to Songiso et al., (2020) two thirds of female patients with breast cancer show up with late stage disease leading to high mortality rates due to delays in symptom recognition and diagnosis.

In Zambia, the Ministry of Health has put in place cancer awareness and prevention programs such as breast self -awareness education, clinic breast examination, breast ultra sound and ultrasound guided breastbiopsy in some parts of the country (Ministry of Health, Annual Cancer Disease Hospital Report, 2013). Despite these preventive efforts by the ministry of health there is still need for companies to

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deliberately screen women employees' for attitudes, knowledge, and perceptions towards breast cancer because few women take the initiative to go for check. Organisations that aim to compete through its human resources need to ensure that wellness is established through breast cancer screening. –

One instrument that can be used to diagnose employees' breast cancer attitudes, knowledge, and perceptions is the Breast Cancer Screening Beliefs Scale (BCSBQ). This 12-item instrument was developed by Kwok, Fethney and White (2010) on Chinese women in Australia and assesses women's attitudes, knowledge, and perceptions regarding breast cancer and their screening practice in the area of mammography (Nia, Behmaneshi, Kwok, Firouzbakht, Ebadi & Nikpour, 2020). Before practitioners can use the instrument with confidence in Zambia there is a need to psychometrically validate the instrument.

It is therefore important that organizations are proactive when dealing with employee wellness by screening employees' knowledge, attitudes, and perceptions. Considering that the BCSBS is one of the instruments used to measure employees' breast cancer knowledge, attitudes, and perceptions, and has got good psychometric properties as confirmed in other studies there is therefore a need to validate this instrument in Zambia if health practitioners and employers are to use the instrument with confidence.

Objectives

The general objective of the study was to empirically evaluate the reliability and construct validity of the Breast Cancer Screening Beliefs Scale (BCSBS). on the Zambian Sample. Specific operational objectives were:

1)To confirm the reliability of the Breast Cancer Screening Beliefs Scale by computing the Cronbach's alpha reliability coefficient;
2)To evaluate the construct validity of the Breast Cancer Screening Beliefs Scale by testing the measurement model goodness of fit using the confirmatory factor analyses;
3)To confirm the discriminant validity of the Breast Cancer Screening Beliefs Scale.

Hypothesis

The overarching substantive research hypothesis is that the Breast Cancer Screening Beliefs Scale provides a construct valid and reliable measure of wellness, healthiness and satisfactory (acceptable) living as defined by the instrument among Zambian citizens the overarching substantive research hypothesis can be divided into the following specific operational hypotheses:

- The construct referenced inferences derived from the Breast Cancer Screening Beliefs Scale, could be considered valid (i.e. permissible) if: The measurement model implied by the scoring key and the design intention on the manner in which the Breast Cancer Screening Beliefs Scale items should reflect the latent dimensions of the breast cancer construct shows close (or at least reasonable) fit;
- The unstandardized factor loadings are statistically significant ($p < .05$);
- The completely standardized factor loadings are significant and large ($\geq .50$);
- The unstandardized measurement error variances are statistically significant ($p < .05$);
- The completely standardized measurement error variances are small ($\leq .75$);
- The inter- hidden measurement correlate statistically significantly ($p < .05$) but low with each other.

RESEARCH METHODOLOGY

Research Design

A quantitative ex post facto research design through structural equation modelling (SEM) was used to test the substantive research hypotheses.

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Research Method

Sample

The unit of analysis for this study comprised of 207 Zambian working women from an energy sector company. 300 questionnaires with cover letters were distributed to identified participants and 207 completed questionnaires were returned. The sample had a mean age of 3.17 and standard deviation of 1.31. The level of educational qualifications in the sample were distributed as follows, certificate (14%), diploma (40%), bachelor's degree (33.8%), master's degree (8.7%), Ph.D (1.4%), and others (1.9%).

Sampling

A non-probability sampling method, specifically convenience sampling, was used due to the large number of sample sizes required by SEM.

Measuring Instruments

Data was collected using the breast cancer screening beliefs scale. The instrument has three sub-scales namely the screening attitude, screening knowledge and perceptions, and screening practice. The Cronbach alpha of the three subscales ranges between .81 to .91 (Kwok, Pillay & Lee, 2017). The first sub-scale has four items with an acceptable Cronbach alpha of 0.836 and assesses the attitudes of women towards general health screening despite feeling healthy (Nia et al., 2020: Nunnally & Berstein, 1994). The measured factor is in line with Champion and Miller (1992) perceived vuerability construct of the health belief model in that the susceptibility construct refers to the belief about the risk of developing a disease such as breast cancer.

The Screening knowledge and perception subscale measures women's knowledge and perception concerning the probability of reducing breast complications or postponing breast cancer induced death through appropriate screening using four items with a reported Cronbach alpha of 0.74 (Nia et al., 2020). The screening practice subscale has three items that assesses mammography related behaviour and its barriers and has an acceptable Cronbach alpha of 0.786 (Nia et al., 2020).

RESULTS AND ANALYSIS

Missing Values

To ensure that all cases included in the selected sample formed part of the analyses, the problem of missing values had to be addressed. Treating missing values is the process of dealing with data sets with incomplete responses (Joreskog & Sorbom, 2006). In the present study this problem was addressed through multiple imputation. Multiple imputation conducts several imputations for each missing value. Each imputation creates a completed data set which could be analysed separately in order to obtain multiple estimates of the parameters of the model (Raghunatha & Schafer as cited in Dunbar-Isaacson, 2006).

Reliability analysis

Reliability coefficients results are shown in table 1. Reliability coefficients were calculated using SPSS (Version 25) for all the three subscales. Scale reliability analysis results can generally be considered satisfactory. Two of the three subscales meet the benchmark reliability standard of greater than 0.70 (Pallant, 2010). The knowledge and perception subscale obtained a cronbach alpha of .866. The screening practice subscale also returned a high internal consistency coefficient of .815. The alpha coefficient derived for the attitude towards general health subscale of .643 was below the threshold of .70 and weaker than the one reported by Nia et al., (2020). The relatively low internal consistency result for the attitude towards general health subscale is noted as a limitation for this study. Two items in the scale were considered problematic and were consequently flagged and deleted.

Exploratory factor analysis

Exploratory factor analysis (EFA) was used to investigate the unidimensionality assumption with regards to each of the three subscales.

All three subscales were found to be uni-dimensional. The items comprising the three scales all reflect a single underlying factor. All factor loadings were acceptable (> 0.50) and variance explained in each factor was satisfactory (> 40%). According to Tabachinick and Fidel (2007) when the KMO approaches unity, or it achieves a value bigger than .60 the correlational matrix is deemed factor analysable. All KMO values were bigger than .60. The correlation matrix showed that all correlations were larger than .30 and all were significant (p?.05).

Multivariate normality

Robust maximum likelihood (RML) estimation method was performed to normalise the data.

Confirmatory factor analysis (CFA) results

Goodness-of-fit: The measurement model

The goodness of fit statistics for the measurement model are presented in Table 3 below. The RMSEA value of 0.0211 indicates good model fit in the sample. Results of the incremental fit measures indicate that the model achieved GFI (0.960), NFI (0.980), NNFI(0.998) , CFI(0.998), IFI(0.998), and the RFI (0.972) indices exceeding .90 which represent good fit (Diamantopoulos & Siguaw, 2000; Kelloway, 1998).

Table 1: Reliability of the measurement scales

Scale	No. items	?
Screening Attitude	3	.643
Knowledge/perception	4	.875
Screening Practice	3	.815

Table 2: Exploratory factor analysis output

Dimension	No. items	Factor loadings	% variance
Screening Attitude	3	0.42-0.71	40.06
Knowledge/perception	4	0.73-0.88	62.35
Screening	3	0.69-0.83	60.04

Table 3: Goodness-of-fit indices for the measurement model

Model	RMSEA	P/Fit	SRMR	GFI	NFI	NNFI	CFI	IFI	RFI
Meas	0.0211	0.892	0.0364	0.960	0.980	0.998	0.998	0.998	.972

Note: RMSEA, root mean square error of approximation; Pclose fit, P-Value for test of close fit (RMSEA < 0.05); SRMR, standardised root mean residual; GFI, goodness-of-fit index; NFI, normed fit index; NNFI,

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS |

non-normed fit index; CFI, comparative fit index; IFI, incremental fit index; RFI,relative fit index

Measurement model factor loadings

The completely standardised factor loading for the items contained in the overall measurement model as shown in table 4 are generally satisfactorily large >.50 (Hair, Black, Babin, & Anderson, 2010) except for one item SA1 whose value (0.372) had a relatively low loading on its hypothesized latent factor.

Figure 1. Path diagram of the fitted bifactor DBQ measurement model (completely standardised solution)

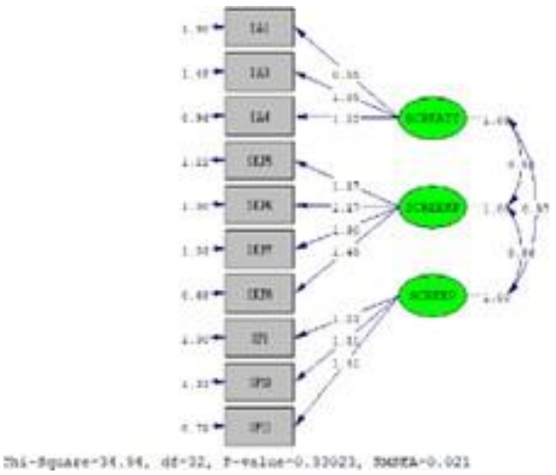

Table 4: Completely standardised lambda-X factor loading matrix of the BCSBQ measurement model.

	MSEAQ
SA 1	0.372*
SA 3	0.653*
SA 4	0.779*
SKP5	0.726*
SKP6	0.761*
SKP7	0.790*
SKP8	0.868*
SP 9	0.776*
SP 10	0.694*
SP 11	0.851*

Note: SA refers to screening attitudes errors, SKP refers to screening knowledge and perceptions, SP refers to screening practice * (p > .05) The completely standardised measurement error variances are shown in table 5. All the measurement error variances are satisfactorily small (≤ .75) except for item SA1 (0.861).

The squared multiple correlations (R2) of the indicators depict the extent to which the measurement model is adequately represented by the observed variables (Byrne, 1998). According to Diamantopoulos and Siguaw (2000) a high R2 value would indicate that variance in the indicator under discussion reflects variance in the latent variable to which it has been linked to a large degree. An examination of the R2 values shown in table 6 reveals above average correlations except for variables SA1 and SA 3 which were falling below (> .50).

Table 5: Completely standardized measurement error variances

SA1	SA3	SA4	SKP5	SKP6	SKP7	SKP8	SP9	SP10	SP 11
0.861	0.574	0.394	0.472	0.421	0.376	0.247	0.398	0.518	0.276

Table 6 –Squared multiple correlations for the items of the BCSBQ

SA1	SA3	SA4	SKP5	SKP6	SKP7	SKP8	SP9	SP10	SP11
0.139	0.246	0.606	0.528	0.579	0.624	0.753	0.602	0.482	0.724

In terms of the dissected overarching substantive research hypothesis, the BCSBQ to a limited degree met this evidentiary burden. The measurement error variances ??ii were statistically insignificant (p > .05)

Discriminant Validity

Excessively high correlations between the latent variables in the phi matrix are in itself very strong evidence of lack of discriminant validity (Chikampa, 2013). An examination of the phi matrix of the BCSBQ model (see Table 7) revealed moderate correlations (between .861 and .505) between the dimensions of the BCSBQ. Discriminant validity therefore did not present a problem. More sophisticated analyses of the discriminant validity with which the BCSBQ measures the three latent dimensions of the breast cancer screening belief construct (i.e., calculating the 95% confidence intervals for ?kj and calculating the average variance extracted (AVE) for each latent dimension of the breast cancer screening belief construct and comparing AVEk and AVEj with ?²kj) was not considered necessary

Table 7: Inter latent breast cancer belief screening dimension correlations

	SCREE AT	SCREE KP	SCREE PR
SCREE AT	1.000		
SCREE KP	0.505	1.000	
	(0.071)		
	7.130		
SCREE PR	0.568	0.861	1.000
	(0.071)	(0.044)	
	8.021	19.484	

DISCUSSION

The objective of this study was to assess the reliability and construct validity of the BCSBQ on the Zambian sample. The two sub-scales recorded high-reliability coefficients above the .70 threshold (Nunnally & Bernstein, 1994) except for one. The measurement model was found to be Uni-dimensional and accounted for more than 40% of the variance. The measurement model achieved good model fit. The results of good model fit are in line with those of Nia et al., (2020) and Kwok et al., (2017). Support for the construct validity of the BCSBQ was obtained though in a limited manner. Practically the study makes a significant contribution to human resource management and health literature by providing empirical support for the usage of the instrument in Zambia. These findings suggest that the BCSBQ can measure breast cancer screening factors reasonably well on a Zambian sample.

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CONCLUSION

Results of this study have shown that the BCSBQ has good psychometric properties in general that warrant its usage in Zambia although some items were noisy. Unstandardized factor loadings and measurement error variances were statistically insignificant. However, all the completely standardized factor loadings were large except for one. The completely standardized measurement error variances were also small as in hypothesis four except for one item. Discriminant validity was also confirmed. A relatively small sample size in this study could have had a huge effect on the result. SEM requires huge sample sizes if good results are to be obtained. Future studies should replicate the study using bigger and culturally diverse samples.

Due to limitations noted above caution should be taken in its usage.

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