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Physicians Attitude towards Reporting Medical Errors at Seven Public Hospitals in Makkah

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Abstract: **Collecting data about medical errors is important in order to improve patient safety. However, factors affecting medical errors reporting by physicians are poorly understood.**
Objectives and study design: This study develops a theoretical framework based on the theory of reasoned action (TRA) and social cognitive theory (SCT) to study factors that may influence physicians to report medical errors. These factors include gender, loss of reputation, social image, punishment, relationship with senior, incentives and attitudes towards reporting medical errors. A multi-section questionnaire measuring the factors was distributed to physicians at seven public hospitals in Makkah.
Results and Conclusions: An exploratory factor analysis was performed, and found that the measures demonstrated acceptable convergent validity. The results of the correlations analysis showed that the measures are discriminately valid. Then, the research model was tested using path analysis. The analysis of the responses from 301physicians found that physicians with high attitudes towards reporting medical errors had a greater intention to report medical errors. The analysis also found positive links between (a) relationship with senior and attitudes towards reporting medical errors, and (b) the presence of incentives and attitudes towards reporting medical errors. We also found that loss of reputation is related the attitudes of reporting medical errors. Contrary to our prediction, this study did not find support for the posited paths from gender, social image and punishment to the attitudes towards reporting medical errors. An exploratory path analysis showed that social image and relationship with senior is directly related to intentions.

Keywords: **Theory of Reasoned Action (TRA), Social Cognitive Theory (SCT).**

1. INTRODUCTION

To improve patients' safety, it is important to understand the frequency and causes of medical errors. Such data is collected from error reporting systems. Reporting of medical errors relies on a professional culture which physicians and other healthcare professionals view reporting errors as an integral part of learning and quality improvement. Barriers to reporting are diverse, and underreporting of errors is believed to be pervasive. As error reporting generally rely on self-reporting, it is important to understand the factors that cause a physician to report medical errors.

The main purpose of this research is to investigate the factors that may cause physicians to report medical errors. This research is also attempts to address several limitations in the existing literature. First, our review of the literature indicates that only one study [(1)] examined this issue in Saudi Arabia. This study was limited in its research design. It described collected data with summary charts and tables, but did not attempt to draw conclusions about the population from which the sample was taken. Conversely to this, this study explore this issue in Saudi Arabia, and will test hypotheses and draw conclusions about the population based on our sample. Second, Other studies conducted in other countries were limited to analysing factors identified in ad hoc manner [(2)]. Thus, this study will identify factors derived from theories and results of previous research. Third, we did not find any study used a theoretical framework, which made it difficult to compare and

contrast results from different studies and to accumulate knowledge on this important issue [3]. Thus, this study develops a theoretical framework based on the theory of reasoned action (TRA) and social cognitive theory (SCT) to understand what causes physicians to report medical errors. As stated earlier, factors that could influence physicians' behaviour identified from previous research and categorised according to our research framework. Another limitation in the existing literature is that most of the studies used multiple regression to test the relations of the factors affecting reporting medical errors, and it seems that no study used path analysis. In epidemiology, the use and discussion of path analysis has been limited thus far [4]. Path analysis is a statistical technique used to study simultaneously a set of presumed relationships between variables represented in a path diagram. Although path analysis shares similarities with multiple regression, it addresses in a relatively unambiguous way several limitations of multiple regression, including the lack of overall goodness of fit indices, multicollinearity, non-simultaneous parameters estimates, inherent measurement error in predictor constructs and absence of compelling guidelines for deleting and adding framework constructs [5]. Thus, this study used path analysis for model testing.

2. THEORETICAL FRAMEWORK

The Theory of Reasoned Action:

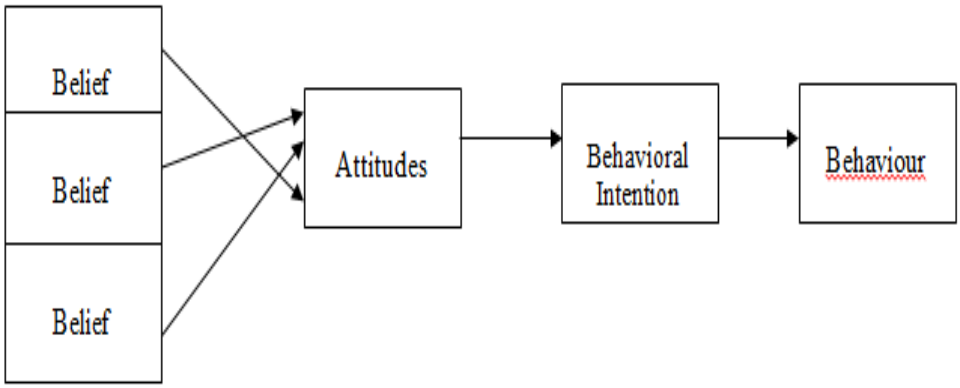


Figure 1: The Theory of Reasoned action (Ajzen, 1991; Ajzen and Fishbein, 1980) [6,7]

Social Cognitive Theory:

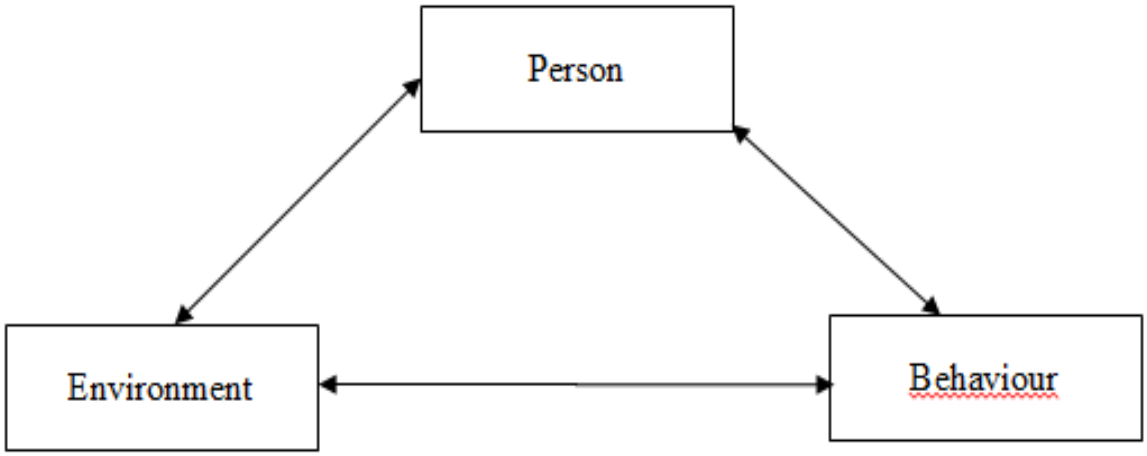
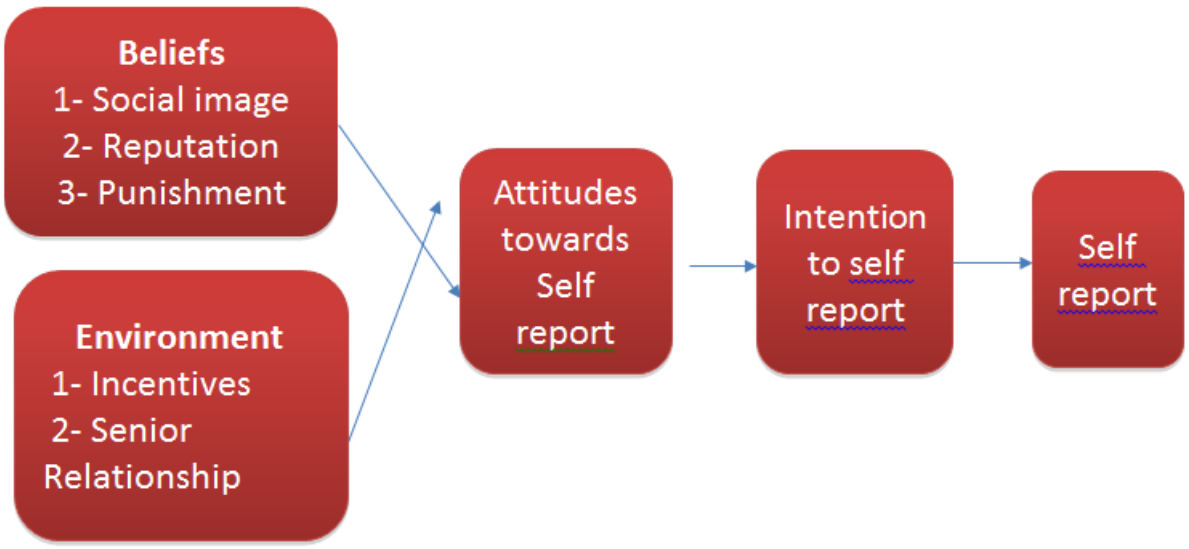


Figure 2. The basic constructs of Social Cognitive Theory (Bandura, 1977, 1982, 1986) [8,9,10].

Social cognitive theory (SCT), as developed by Bandura (1986), is an empirically validated model of human behaviour. It is based on the premise that psychological phenomena are reciprocally shaped by behavioural, personal and environmental factors (Bandura, 1986). People enter any situation with a set of personal factors which interact with the environment factors in such a way as to promote or preclude certain behaviours. Certain behaviour, thus, is determined by environmental and personal factors.

Research Model Development and Hypotheses:



3. METHODOLOGY

A survey method was employed in order to collect the data with a view to exploring the study hypotheses proposed in the previous section.

Survey pre-testing and validation:

The questionnaire was subject to a rigorous validation process before its distribution to the physicians. More particularly, the survey was validated via pre-tests with one researcher. Shewas asked to concentrate on issues of clarity, question wording and validity prior to providing feedback through an interview. These pre-tests resulted in a number of improvements being made to the structure of the questionnaire and the wording of particular questions. A pilot study was then undertaken by ten physicians. They were asked to focus on issues of clarity and the time it took to complete the survey was identified.

Data Sample and Procedures:

The sample in this research consisted of physicians in several (number?) public hospitals in Makkah. The sample was taken from multiple locations to increase the sample size and to assist in improving the generalizability of the results. Makkah has several (number?) hospitals. We contactd each hospital in Makkah , and (number?) hospitals agreed to take part in this research. The physicians were advised in writing that their participation was voluntary and only group data would be analysed. They were informed not to identify themselves on the questionnaire.

4. DATA ANALYSIS AND RESULTS

The data were entered from the questionnaires independently into two separate sheets in a Microsoft Excel workbook. Then the corresponding values in the two sheets were compared with each other and the discrepancies were corrected to reflect the values in the original questionnaires. The data were then imported from Excel into SPSS version 18 and saved in an SPSS system file to which variable labels and value labels were added.

Preliminary Results:

A total of 306 questionnaires were collected. Five questionnaires were discarded due to incomplete responses, resulting in 301 usable questionnaires. Figures 3,4 and 5 show distributions of the demographic variables.

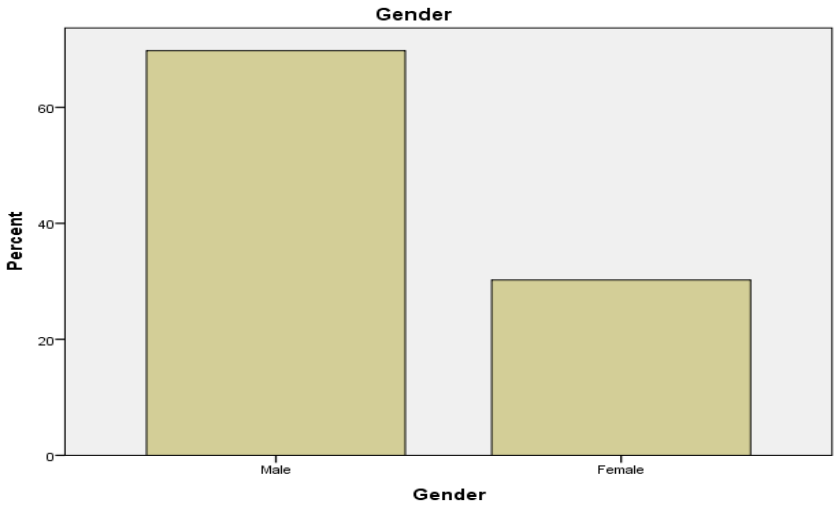


Figure 3 Distribution of participants by gender.

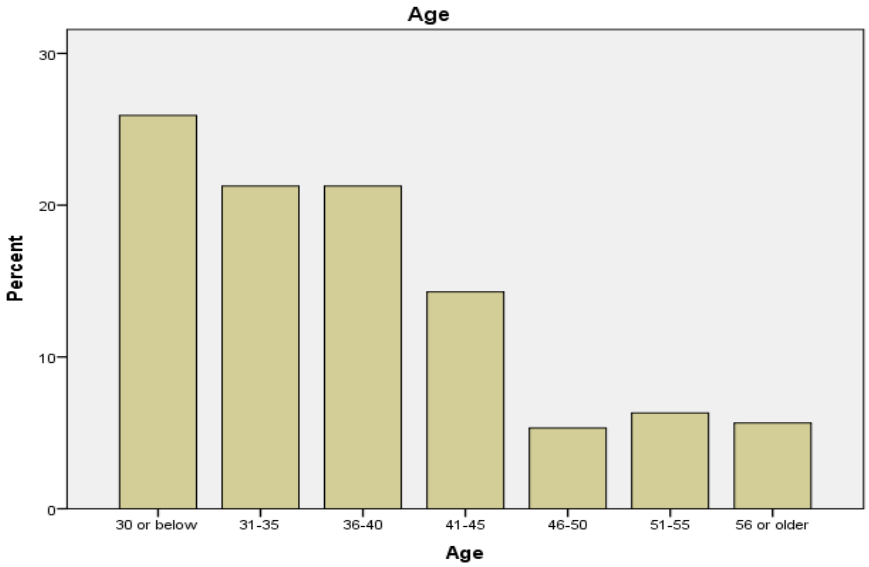


Figure 4 Distribution of participants by age

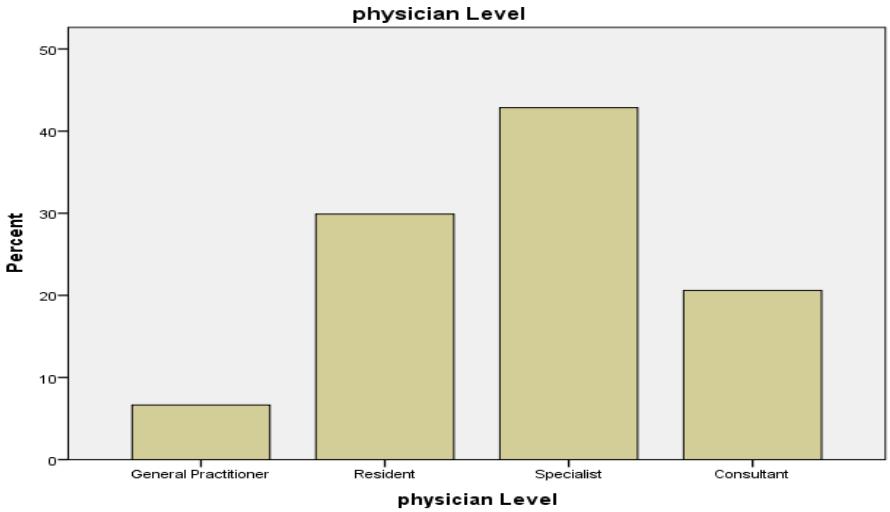


Figure 5 Distribution of participants by level

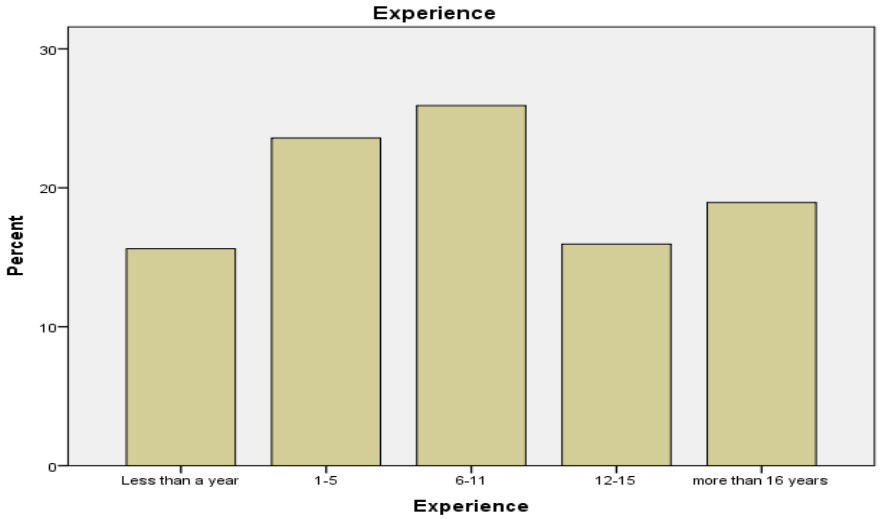


Figure 6 Distribution of participants by experience

The analysis found that 69.8% of the respondents were male and 30.24% were female. 6.6% were GP, 29.9 % were residents, 42.9% were specialists and 26.6 % were consultants. 15.6% have experience less than a year, 23.6% have 1-5 years experience, 25.9% have 6-11 years experience, 15.9% have 12-15 years experience and 18.9 have more than 16 years experience

Reliability and Validity:

Before the item scores from the survey were combined to compute the scale scores, we had to ensure that our measures are reliable and valid. First, we performed exploratory factor analysis, and found that our measures demonstrated acceptable convergent validity (Table 1). Three items dropped out as they have cross loadings.

Discriminant validity:

It refers to the extent to which measures of constructs are relatively distinctive, that their correlation values were neither an absolute value of 0 or 1 (Campbell and Fiske 1959) [(11)]. Correlation analysis was done, and the result is presented in table 3. As can be seen, the factors are not perfectly correlatedwhere their correlation coefficients range between 0 and 1.

Table1 Correlations Between the self-report research framework

		Image	Reputation	Self intention (Mean)	Attitudes (Mean)	Punishment (Mean)	Senior relationship (Mean)	Incentives (Mean)
Image	Correlation	1	.404**	-.160**	-.093	.480**	-.014	.163**
	p-value		.000	.006	.106	.000	.810	.005
Reputation	Correlation	.404**	1	-.192**	-.138*	.436**	.044	.148*
	p-value	.000		.001	.017	.000	.450	.010
Self intention (Mean)	Correlation	-.160**	-.192**	1	.389**	.053	.256**	.131*
	p-value	.006	.001		.000	.362	.000	.023
Attitudes (Mean)	Correlation	-.093	-.138*	.389**	1	-.037	.187**	.248**
	p-value	.106	.017	.000		.520	.001	.000
Punishment	Correlation	.480**	.436**	.053	-.037	1	.071	.179**

(Mean)	*p*-value	.000	.000	.362	.520		.222	.002
Senior relationship (Mean)	Correlation	-.014	.044	.256**	.187**	.071	1	.063
	p-value	.810	.450	.000	.001	.222		.277
Incentives (Mean)	Correlation	.163**	.148*	.131*	.248**	.179**	.063	1
	p-value	.005	.010	.023	.000	.002	.277	

Reliability:

Then, a reliability analysis was performed for each scale. Table 3 shows the values of Cronbach's alpha for the four scales that were computed from the item scores. According to Nunnally (1978) [(12)], a scale can be considered sufficiently reliable for basic research if the value of Cronbach's alpha is .7 or higher. The value of Cronbach's alpha for each scale is substantially greater than .7. Thus, all our scales appear to be reliable for use in the analyses.

Table2 Cronbach's Alpha for the first research model scales

Scale Name	Number of Items	Cronbach's Alpha
Intention to self-report	4	.78
Attitudes towards reporting errors	3	.81
Punishment	2	.81
Incentives	3	.77
Relationship with senior	2	.88
Loss of reputation	1	-
Social Image	1	-

Then, the scale score for each of the measured scales was computed for each participant as the mean of the mean of the item scores for the participant for the items associated with the scale. (Of course, this was done after appropriate reversals of reversed items.) Table 4 shows the relevant statistics for the scales on the questionnaire.

Table 3 ***Statistics for the Measurement Scales***

Scale Name	Mean Scale Score	Standard Deviation	Skew-ness	Kurto-sis
Intention to Reporting	3.94	0.73	-.64	.53
Attitudes towards Reporting	4.10	0.75	-.94	1.46
Loss of Reputation	2.69	1.08	.12	-.68
Punishment	3.15	0.69	.19	.25
Social Image	2.70	1.16	.14	-.51
Relationship with Senior	3.66	0.89	-.49	.47
Incentives	3.82	.89	-.75	.68

**Items could have scores between 1 and 5, with a score of 3 representing a middle-of-scale response.*

Since the standard approach to path analysis assumes that each of the scales involved in the path analysis actually has (roughly) a normal distribution, it is reasonable to test whether the distributions are normal. Two commonly used tests to determine whether a set of values follows a normal distribution are the Kolmogorov-Smirnov test and Shapiro-Wilk test. Table 5 shows the results of these tests for the scores on each of the scales.

Table 4 Tests of Normality of the Scale Scores

Scale	Kolmogorov-Smirnov*			Shapiro-Wilk		
	Statistic	*df*	*p*-Value.	Statistic	*df*	*p*-Value
Intention to Reporting	.156	326	<.0005	.965	326	<.0005
Loss of Reputation	.118	326	<.0005	.980	326	<.0005
Punishment	.069	326	.001	.990	326	.019
Social Image	.071	326	<.0005	.989	326	.015
Relationship with Senior	.060	326	.007	.983	326	.001
Presence of Incentives	.166	326	<.0005	.890	326	<.0005

Almost all the scales in Table 4.2 have *p*-values that are well below 0.05. The low *p*-values imply that there is strong evidence that most of the scales are not perfectly normal. Thus the path analyses below were performed using a "robust" approach that does not require that the assumption of normality of the scale scores be satisfied.

Path Analysis:

Path analysis with EQS version 6.1.97 (Bentler, 2010) [(13)] was performed to test our research hypotheses. Path analysis is a statistical technique used to study a set of presumed relationships between variables represented in a path diagram, such as the diagram shown above in Figure (the one in the research framework and hypotheses section)

As with any path diagram, it is possible that some of the paths shown on Figure (the one in the research framework and hypotheses section) are imaginary, and do not actually "exist" in physicians. If a path does not exist, this would imply that the *expected* value of the associated path coefficient would be zero (which would make the path vanish). However, a path analysis program almost never finds that a path coefficient is *exactly* zero. As suggested by Byrne (2006) [(14)], this is due to (a) inaccuracies in the measuring instruments, (b) incomplete specification of the list of relevant variables, and (c) other possible sources of error.

On the basis of the paths shown in Figure, a path analysis was performed of the data. Since the data represent 301physicians, this implies that they satisfy Hatcher's (1994) [(15)] recommendation of a minimum of 200 participants

There were indications of multivariate non-normality (i.e., Mardia's normalized estimate > 5). Thus, there is good evidence that the data do not exhibit multivariate normality. Therefore, we used the robust maximum likelihood estimation procedures, and relied on two primary indicies to assess model-data fit: the comparative fit index (CFI) and the root-mean-square error of approximation (RMSEA). Even though there are no absolute standards for assessing the model-data fit, CFI values of >.90 (Hoyle &Panter, 1995) [(16)] and RMSEA values of <.08 (Browne &Cudeck, 1992) [(17)] are typically considered as indicating acceptable levels of fit, with higher CFI (.95 and above) and lower RMSEA (.06 and below) values suggesting more optimal fit (Hu &Bentler, 1999) [(18)].

The path analysis obtained the path coefficients shown in Figure 7

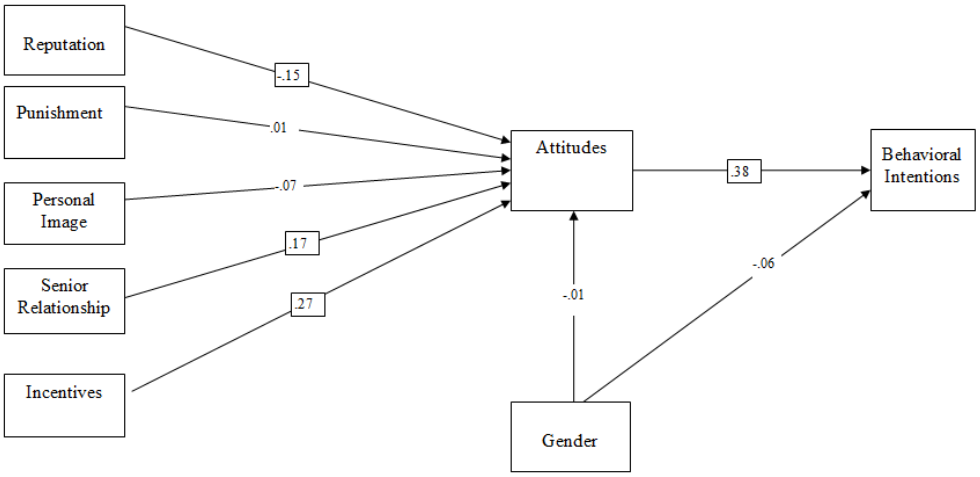


Figure 7 Path diagram for the initial path analysis with computed standardised path coefficients. A box around a coefficient implies that the coefficient is significantly different from zero at the 95% level of statistical significance in the robust analysis.

Table 5 Fit Indices for the Initial Model Under the Maximum Likelihood and Robust Approaches

Index	Maximum-Likelihood Value	Robust Value
Bentler-Bonett Normed Fit Index	0.89	0.89
Bentler-Bonett Non-Normed Fit Index (NNFI)	0.44	0.48
Comparative Fit Index (CFI)	0.90	0.90
Bollen's (IFI) Fit Index	0.90	0.91
McDonald's (MFI) Fit Index	0.95	0.96
Joreskog-Sorbom's GFI Fit Index	0.97	-
Joreskog-Sorbom's AGFI Fit Index	0.81	-
Root Mean-Square Residual (RMR)	0.03	-
Standardized RMR (SRMR)	0.04	-
Root Mean-Square Error of Approximation (RMSEA)	0.14	0.12
90% Confidence Interval of RMSEA	0.89, 0.185	0.083, 0.17

CFI value indicates that our structural model produced adequate fit to the data, not optimal though. CFI and RMSEA values show that the fit of our structural model can be improved.

In Figure 1 the standardised coefficients shown inside boxes in the figure are significantly different from zero in the robust analysis at the 95% level, and the coefficients without boxes are not significantly different from zero. Of course, the coefficients that are not significantly different from zero are generally smaller than the significant coefficients because they are closer to zero. If we were to repeat the research with a very large sample, we might find that these non-significant coefficients "in reality" have opposite signs, or we might find for many of the coefficients that (even in a very large sample) there is no evidence that they are significantly different from zero.

In studying Figure 8 it is helpful to focus first on the largest coefficients because they reflect the strongest relationships. For example, it can be seen that the largest path coefficient in the figure is 0.38 on the path between attitudes and intention. This implies that the relationship between these two variables is relatively strong. Similarly, the relationship between incentives and attitudes is strong, with a path coefficient of 0.27.

We can use the statistical tests summarised by the presence and absence of boxes in Figure 1 to assist with testing the research hypotheses. In testing the hypotheses it is important to note that no strong inferences can be made about causation. In particular, direct causation between the variables *may* be involved or the relationships between a response variable (at the tip of an arrow) and a predictor variable (at the tail of the arrow) may be a mere association, with the values of both the associated variables being actually *caused* by some third variable (or group of variables) that is omitted from the path diagram. That having been said, it is useful to ask whether at least some of the relationships may be causal. For example, in the case of the strong relationship between attitudes and intention it seems reasonable to think that this relationship may be causal. That is, it seems reasonable to think that if we could somehow *cause* a real increase attitudes in physicians, then this might result in (i.e., *cause*) an increase in the intentions (regarding reporting medical errors) in the physicians.

The *direction* of the presumed causation is indicated by the directions of the arrows on the path diagram. Although the directions of causation are presumed on the basis of TRA and SCT theories, they are not somehow established directly in the path analysis. Thus, for example, Figure 7 suggests that intention in a physician may be a function of (a) the gender score (0 for males or 1 for females), (b) the attitudes. Regarding gender, the suggested direction is reasonable because gender is assigned before birth, and thus if there is a causal relationship between gender and intention, a physician'sintentions would presumably depend on his or her gender, and not the other way around.

Exploratory Path Analysis:

Figure 1 suggests that many paths are not statistically significant . Therefore, it is sensible to omit these paths from the model and then to recompute the model. EQS provides output from the Wald statistical test for dropping paths from a model and provides output from the Lagrange multiplier statistical test for adding paths to a model. The Wald test applies an algorithm to the data to identify which of the included paths are weak and therefore possibly non-existent, showing the weak paths in order, with the weakest paths in the model first. It is sensible to omit the weakest paths, one at a time, and recompute the model to see what effects the omissions have on the model.

Similarly, other paths may belong in the model that were not included. EQS provides output from the Lagrange multiplier statistical test for adding paths to the model. These tests apply an algorithm to the data to identify which omitted paths are strong, showing the omitted paths in order, with the strongest omitted paths first. It is sensible to include the strongest paths, one at a time, and recompute the model to see what effect the inclusions have on the model.

Using the Wald and Lagrange multiplier tests an exploratory approach was followed to see how the model might be improved. Paths were added and dropped until a "reasonable" model was obtained on the basis of judgment based solely on the various statistics obtained in the analysis.Twoof the resulting paths in this model did not obtain statistical significance, but were kept because they were sensible according to the Wald and Lagrange statistics and according to the Comparative Fit Index. Since they are not significant these two paths may not belong in the model although it is also possible that they belong, but are not strong enough to achieve statistical significance. This analysis led to the path diagram shown in Figure 8.

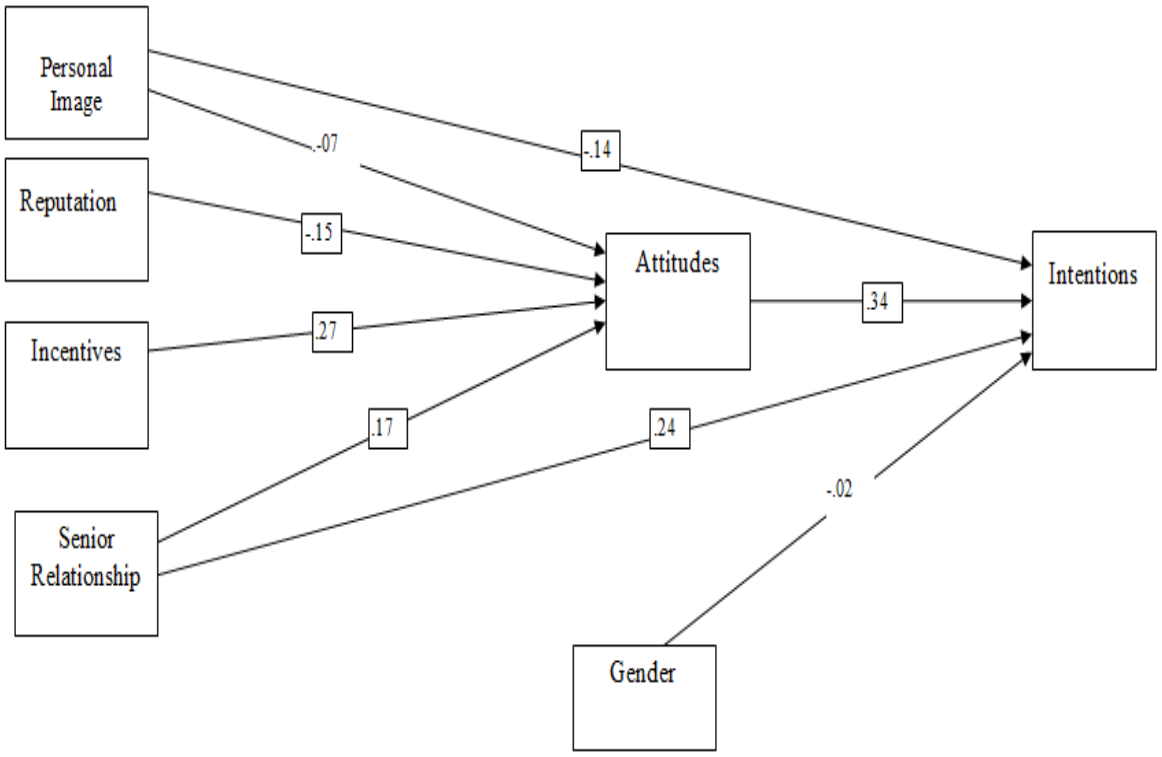


Figure 8 Path diagram for the exploratory path analysis with computed standardised path coefficients. A box around a coefficient implies that the coefficient is significantly different from zero at the 95% level of statistical significance in the robust analysis

No good evidence of any paths between punishment and attitudes and intentions.Thus the variable was omitted from the model. We also omitted the path between gender and attitudes. We also added direct paths between senior relationship, personal image variables and intentions.

Mardia's normalised coefficient for multivariate kurtosis had a value of 12.0. Therefore, there is again good evidence that the data do not exhibit multivariate normality. Therefore, the analyses were performed using both the maximum-likelihood approach assuming multivariate normality and the "robust" approach that does not assume multivariate normality.

5. DISCUSSION

Developing a Safer Health System centered on the recommendation that avoidable unfavorable occasions in healthcare facility were a leading cause of death around the world [19]. This research highlighted findings from the rewards as well as perspectives towards reporting clinical mistakes gauging the factors was distributed to physicians at 7 public hospitals in Makkah. Using a number of path evaluations that discovered that greater than P< 0.0005 of physicians planned to report the error suggest that there is solid proof of improving the awareness among physicians of mistakes causing adverse events, and greater than with P > 0.05 were having solid proof of mindset in the direction of concrescences after reporting the error. this is sustained by information discovered in comparable research study was performed in Harvard medical college [20]. Errors that take place either do or do not harm patients and mirror many issues in the system' [21] such as a society not owned towards safety and security as well as the visibility of negative working problems for nurses. To efficiently avoid future mistakes that can trigger patient injury, renovations have to be made on the hidden, more-common as well as less-harmful systems issues [22] frequently related to near misses. Systems troubles can be identified through records of errors that hurt patients, mistakes that occur however do not result in patient injury, as well as errors that might have created damage yet were minimized somehow before they ever before reached the patient [22].

According to our results, the least are worried about the loss of credibility or modification of social image, and punishment applied were the peak in between our results. Lawton and also Parker et al [23] examined cases reported by doctors, midwives and also nurses and discovered that doctors are reluctant to report their peers' mistake to a superior member of staff, also in cases of reverse end result mistake (mean 2.97 from 5), and they are more probable to report a bad end result error to their colleagues than excellent or poor end result mistakes. Our study shows comparable outcomes in terms of reporting to the clinical council, although we reviewed various other feasible techniques to peer error. In agreement with the results of our research, one of the most regularly expressed point of view on this problem in the literary works is that doctors need to call their peers and also educate them of their error when they observe one, and also were fretted of shedding track record or were extremely worried of penalty [24]. Wu et al, [25] thinks physicians can disclose the error to the patient straight if this method is not efficient, while a few other think the witnessing medical professional can report the mistake to the authorities when the erring doctor cannot disclose it to the patient [24].

The involvement of physicians in creating records might account partly for distinctions in the kinds of occasions captured and also videotaped in each system [24]. The nursing team goes into most event reports into an electronic system in our existing hospital system, and also these mostly associate with drops, drugs, as well as running area logistics. Locals and also participating in physicians might not check out using this system as an essential part of their professional obligations. The worth of informing physicians, residence staff, as well as clinical pupils about patient safety and security cannot be overstated [25]. A current research indicated substantial variations of occurrence coverage amongst the different medical specializeds that referred the attitudes as well as participation of clinical staff [26]. Just like our task, they discovered physicians were most likely to participate when the technique of coverage was incorporated within medical, as opposed to supervisory, systems of quality improvement.

6. LIMITATIONS

- This research is observational and thus, strictly speaking, causal inferences cannot be drawn
- This research is also limited by difficulties in gathering a large amount of data from a broad range of hospitals.
- This research is also limited by factors (e.g., motivation, distraction and boredom) that commonly occur in using survey methodology
- Another limitation involves the measurement of punishment the poor performance of the punishment variable may be due to insufficient content validity of the measure that was used.
- With respect to external validity, this research is limited by the sample characteristics. The research sample was limited to physicians at seven public hospitals in Makkah, while the population of interest is physicians in all of Saudi Arabia and, more broadly, physicians in the world. Thus, care must be exercised when generalising the findings from the Makkah setting to other hospitals settings.

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