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### ARAB WOMEN'S LEADERSHIP RESEARCH: A BIBLIOMETRIC ANALYSIS OF PUBLISHED ARTICLES PUBLISHED BETWEEN 2018 AND 2022

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#### ABSTRACT

This study presents a bibliometric analysis of publications on the leadership of Arab women from the Scopus database between 2018 and 2022. Based on the keywords used, which are related to women's leadership in the article title, abstract and keywords of the study, 188 documents were retrieved for further analysis using various tools. We used Microsoft Excel to conduct the frequency analysis, VOS viewer for data visualization, and Harzing's Publish or Perish for citation metrics and analysis. This study reports the results using standard bibliometric indicators such as the growth of publications, authorship patterns, collaboration, prolific authors, country contributions, most active institutions, preferred journals, and top-cited articles. The findings show a continuous growth of publications on Arab women's leadership research for the selected timeframe. The United Arab Emirates was the largest contributor to Arab women's leadership research, followed by Saudi Arabia and Jordan. The International Journal of Leadership in Education remained the foremost publication associated with Arab women's leadership research. Zayed University, United Arab Emirates, is expected to be a good candidate for collaborative research in this field.

Keywords: Arab, Bibliometric Analysis, Women Leadership

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#### INTRODUCTION

As the world progresses toward the United Nations' Sustainable Development Goals (SDGs), the spotlight on gender inclusion and equality intensifies, particularly in the Arab world. This heightened focus has spurred academic interest in having more Arab women in leadership positions (Bin Bakr & Alfayez, 2022) and promoting gender equality (Hakiem, 2023) in the workplace. This bibliometric analysis aims to map this burgeoning field's evolution and current state, focusing on scholarly articles published from 2018 to 2022.

The International Labour Office (ILO) declared that women's leadership representation progressed slowly globally, from 30 percent in 2010, to 32.4 percent in 2019 (ILO, 2020). Similarly, the Global Gender Gap Report of the World Economic Forum (WEF, 2022) also revealed that women's average share in leadership across industry sectors was 36.9 percent in 2022, recording only 3.6 percent growth between 2016 and 2022. Despite this slow rate of progress, the global effort towards gender parity in leadership position marches on.

In Arab countries, research indicates that the government has put in place several measures to promote gender equality in the workplace, which has resulted in more women advancing into various leadership and managerial positions (Abalkhail, 2016; Alrashidi & Ismail, 2024; Rehman, 2017; Rehman & Alorifi, 2024). Some of these measures include free education, economic resources, and the creation of more job prospects for women in public and commercial sectors. For example, in Saudi Arabia, the government's Vision 2030 for women's empowerment demonstrates a significant shift in focus from women's right to jobs and education to their positions (Rehman & Alorifi, 2024). In the same vein, while examining the economies with the highest ratio of women in leadership positions, the International Labour Office highlighted that in 2019, the United Arab Emirates was one of the economies that had the highest improvement and ratio of women in management and senior positions with 29 per cent of the increase over time (ILO, 2020). This indicates that there is significant progress towards gender equality in leadership.

Our study, while recognizing the growing body of research asserting the benefits of women in leadership roles - such as enhanced organizational performance and a more diverse, inclusive work environment (Brabazon & Schulz, 2020; Bracken et al., 2023; Wolverton et al., 2023) - delves deeper into the specific challenges and opportunities faced by female leaders in the Arab context. These challenges, often rooted in cultural expectations and societal norms, play a crucial role in shaping the selection of leaders and career trajectories of Arab women who are regarded as untapped resources (Abdullah Dahlan, 2023).

Our study uses a systematic, quantitative approach to examine the literature in Arab women's leadership studies to identify related patterns and trends. Using the Scopus database, recognized for its validity and reliability, we analyse academic studies, highlighting major milestones and opening opportunities for further research.

To this end, the study investigates the literature to understand the patterns and changes in the research trends on Arabic women's leadership. Specifically, the primary purpose of this bibliometric analysis is to address this research question:

1. What are the publication trends, growth, collaboration, country contributions, most active institutions, preferred journals, top-cited articles and the prolific authors of articles on Arab women's leadership?

Besides adding to the body of knowledge on women's leadership in Arab contexts, this bibliometric study provides a good basis for further research initiatives. It highlights continuous research attempts to promote equality and women's leadership empowerment in organizational settings, offering scholars and politicians alike insightful information that will help shape the future of gender equality in the Arab world. Additionally, seeing that women leaders come with unique traits and characteristics, especially in applying their motherly approach to leadership,



the feminine style of leadership is beneficial. It could also be the preferred type of leadership needed in the challenging world of academia (Fauzi et al., 2024).

#### MATERIALS AND METHODS

Our bibliometric analysis, conducted using Elsevier's Scopus Directory on July 2, 2023, employed a multistep, targeted search strategy to examine the state of women's leadership in Arab countries from 2018 to 2022. The search was limited to recent research and five years, which enabled the review of current trends and the maintenance of reasonable data size. The primary keywords 'Gender,' 'Female,' and 'Women,' combined with 'Lead\*,' were strategically chosen to capture the breadth of women's leadership research. Adding asterisk and quotation marks in Scopus searches allows for broader results search and enhances the ability to find appropriate terms, thereby providing results for terms with or without accents and punctuation (Campos-Teixeira & Tello-Gamarra, 2022).

The initial broad search yielded numerous results (Searches I and II). Subsequent filters incrementally narrowed the focus to Arab countries based on the inclusion and exclusion criteria of recent publications (2018-2022), articles in English, journal sources, and the specific fields of business, management, and accounting. This meticulous approach led to a final dataset of 188 pertinent documents (Search IX).



Figure 1. Methodology Used to Decide How to Choose the Samples

Note: For each phase of the research approach, the number of articles discovered is shown in this graph.

We used VOSviewer for network mapping of author, institutional, and national/regional collaborations to investigate this dataset. We also used Biblioshiny to create thematic evolution maps for author keywords and analyse the relationships between keywords, authors, and sources. For additional statistical analysis and visualisation, the R software was utilised.

The methodological approach is summarised in Figure 1, which depicts the search and selection process from identification, screening, eligibility, and inclusion. The flowchart shows the final selection of articles included in the



analysis, the number of papers initially detected, and the rationale for exclusions at each stage.

While our research gives valuable insights, it is vital to recognize the limitations of our methodology. The use of particular databases and keywords, along with the emphasis on English-language papers, may generate biases and cause relevant research published in other languages or databases to be overlooked. Working with multilingual academics would facilitate the inclusion of articles written in other languages and ensure that different perspectives are adequately represented in future research.

Furthermore, the selection of a single database (Elsevier's Scopus database) in this study is based on Bang et al. (2023), who proposed that utilizing a single database reduces human error than using many databases that present the required data in different ways. To properly synthesize our existing review, future studies can examine multiple databases for a broader view.

This methodological approach offers a comprehensive and focused analysis, providing insightful data on the patterns and trends in the literature on Arab women leaders.

#### RESULTS

This bibliometric analysis examined 188 publications published between 2018 and 2022, showing patterns and trends in Arab women's leadership studies. The yearly distribution of these documents is visually represented in Figure 2, which illustrates the overall trend and fluctuations in research output throughout the study period.





*Note: The x-axis denotes the publication years, while the y-axis quantifies the aggregate papers published annually.* 

An increase in 2019 indicates a growing scholarly interest in women's leadership, with publications totalling 38, exceeding the previous year's production. This increased interest may also be linked to globalization, internationally accelerating needs, improved statistical methodologies, and the availability of big data (Gumus et al., 2018). The next year saw a drop to 29 publications, most likely because of the global pandemic. Resilience in academic endeavours is evidenced by the rebound in 2021 to a count mirroring that of 2019, which crescendoed into a pronounced peak in 2022, where 61 papers were published. This pattern suggests a robust and growing scholarly focus on the subject matter. Furthermore, this result shows how knowledge is continuously evolving per the use of keywords and how scholars' contributions help other researchers build on their work.





Figure 3. Documents by Country or Region: 2018–2022

Note: The x-axis represents the number of papers published, aligned with the authors' affiliated countries, spanning the study period; the y-axis lists these countries or regions.

The geographic analysis of the publications highlights a significant concentration of research emanating from the United Arab Emirates, accounting for 48 publications. Saudi Arabia and Jordan followed, with substantial outputs of 32 and 28 publications, respectively. The United Kingdom, the United States, and Egypt also contribute noteworthy quantities, reflecting a blend of regional and global research efforts. This dispersion underscores an 81.28% predominance of studies within Arab nations, with the remainder from non-Arab countries, chiefly the United States and the United Kingdom. This geographic analysis identifies the most active authors and potential knowledge domains in women's leadership and its application in leadership and management practices.



Figure 4. Documents for Each Year Organized by Affiliation: 2018–2022

Note: This graph elucidates the total number of publications per annum, distributed among the top ten affiliations, as discerned by our sample selection methodology.

In the institutional landscape, Zayed University leads with 13 publications, with Qatar University, The University of Jordan, and Al Ain University also prominently featured. This pattern indicates that 80% of the leading publications stemmed from Arabian countries, reinforcing the region's commitment to advancing research in women's leadership.





Note: The x-axis scrutinizes the publication years, while the y-axis enumerates the volume of papers by source title, spotlighting the five leading sources within the study period.

Journal contributions are headlined by the 'International Journal of Leadership in Education,' with consistent publications from 2020 onward, followed by other significant journals. The strategic application of search limitations has yielded a focused set of journals, which, despite fewer publications, ensures relevance and specificity to the topic at hand.



Note: Displaying the foremost authors by name along the x-axis, this graph illustrates the exact tally of the papers each author published during the study period.

Koburtay, T., and Syed, J. dominate the authorial landscape with four publications each, demonstrating a significant contribution to the body of knowledge. This is followed by Baroudi, S., with three publications and a cadre of authors, two each, illustrating diverse yet concentrated authorship within the field.



#### Figure 7. *h-index: 2018–2022*



Note: The h-index is represented along the y-axis, correlating with the total number of cited papers on the x-axis.

The h-index, a metric of productivity and citation impact, stands at 22, signifying that among the analysed papers, 22 documents have received a minimum of 22 citations each, a testament to the influential nature of the research within academic circles.





The keyword analysis revealed several themes, with 'Gender,' 'Leadership,' and 'Corporate Governance' among the most prevalent. This keyword constellation, delineated in Figure 8, offers a visual synopsis of the thematic focuses within the corpus.





The interplay between the growth of publications and their citation impact is nuanced. The number of papers published in 2019 and 2020 was greater than that published in other years, as depicted in Figure 9.

	Table 1. Yearly Number of Publications and Citation Matrix							
Year	TNP	NCP	TC	C/P	C/CP	Н	g	
2018	20	19	332	16.60	17.47	2	18	
2019	38	35	542	14.26	15.49	15	22	
2020	29	28	510	17.59	18.21	30	22	
2021	40	28	226	5.65	8.07	28	14	
2022	61	34	152	2.49	4.47	19	9	

Note: TNP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; h = h-index; and g = g-index.

Table 2. Number of Author(s) per Document							
Author Count	Total Publications (TP)	Percentage %					
1	39	20.74%					
2	60	31.91%					
3	50	26.60%					
4	21	11.17%					
5	10	5.32%					
6	3	1.60%					
7	2	1.06%					
8	1	0.53%					
9	2	1.06%					

The citation matrix delineates the scholarly resonance of the papers over time, with those from 2020 having the most citations per publication. Authorship analysis reveals a healthy mix of single and collaborative efforts, with single-authored papers constituting a significant portion of the total.

Table 3 and Table 6 show the most productive authors and the top 20 contributing countries, respectively.



### **Table 3.** Top Ten (10) Most Productive Authors

Author's Name	Affiliation	Country	TNP	NCP	тс	C/P	C/CP	h	g
Koburtay, T	University of Petra	Jordan	4	3	46	11.50	0.75	2	4
Syed, J	Lahore University of Management Sciences	Pakistan	4	3	46	11.50	0.75	2	4
Baroudi, S	Zayed University	UAE	3	3	10	3.33	1.00	1	3
Abalkhail, J. M	Institution of Public Administration	Saudi Arabia	2	2	23	11.50	1.00	2	2
Al Shdaifat, F. H	Al Ain University of Science and Technology	UAE	2	2	8	4.00	1.00	1	2
Alajmi, R	University Utara Malaysia	Malaysia	2	2	8	4.00	1.00	1	2
Alazmi, A. A	Kuwait University	Kuwait	2	2	10	5.00	1.00	1	2
Bouteska, A	University of Tunis el Manar	Tunisia	2	2	4	2.00	1.00	1	2
Cherif, I	University of Sfax	Tunisia	2	1	14	7.00	0.50	1	2
Elamer, A. A	Brunel University London	United Kingdom	2	2	35	17.50	1.00	2	2

Note: TNP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

Rank	Contribution of the Top 2 Country	TNP	ТС	TLS
1	United Arab Emirates	48	323	31
2	Saudi Arabia	32	190	23
3	Jordan	28	326	14
4	United Kingdom	22	300	31
5	United States	19	361	24
6	Egypt	18	120	10
7	Lebanon	15	159	10
8	Tunisia	14	205	12
9	Qatar	12	176	11
10	Kuwait	11	228	8
11	France	10	278	15
12	India	10	42	12
13	Malaysia	9	62	9
14	Australia	8	120	14
15	Oman	8	70	8
16	Pakistan	7	105	9
17	Bahrain	7	30	5
18	Canada	5	22	9
19	South Korea	4	85	7
20	Morocco	4	72	4

Note: TNP = total number of publications; TC = total citations; TLS = total link strength

The synthesis of authorial output and geographic contribution paints a picture of a field marked by individual brilliance and collective endeavour, bridging diverse regions and institutions. Tables 7, 8, and 9 offer insights into



the institutions, journals, and papers that shape the discourse on Arab women's leadership. These tables collectively illustrate the influential institutions and journals driving the research agenda, with a detailed examination of the papers that have left indelible marks on the academic landscape.

Affiliation	Country	TNP	NCP	тс	C/P	C/CP
Zayed University	United Arab Emirates	13	11	71	5.46	6.45
Qatar University	Qatar	11	11	112	10.18	10.18
Cairo University	Egypt	10	9	31	3.10	3.44
Universiti Utara Malaysia	Malaysia	8	8	27	3.38	3.38
Hashemite University	Jordan	7	7	36	5.14	5.14
The University of Jordan	Jordan	7	4	53	7.57	13.25
Al Ain University	United Arab Emirates	6	5	40	6.67	8.00
Jordan University of Science and Technology	Jordan	6	4	22	3.67	5.50
Lebanese American University	Lebanon	6	6	29	4.83	4.83
American University of Beirut	Lebanon	5	5	80	16.00	16.00

Table 5. Most Significant Institutions with a Minimum of 5 Publications

Note: TNP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

Table 6. Top 10 Publishing Journals on Women's Leadership Research								
Source Title	TNP	тс	Publisher	Cite Score	SJR 2022	SNIP 2022		
International Journal of Leadership in Education	9	34	Taylor & Francis	3.1	0.519	0.890		
Gender in Management	7	30	Emerald Publishing	4.8	0.907	1.458		
Journal of Business Ethics	4	166	Springer Nature	12.0	2.590	2.976		
Administrative Sciences	4	12	MDPI	3.9	0.530	1.018		
Corporate Governance (Bingley)	4	119	Emerald Publishing	9.0	1.349	1.901		
International Journal of Organizational Analysis	4	42	Emerald Publishing	4.9	0.592	1.126		
International Journal of Educational Management	3	8	Emerald Publishing	3.6	0.493	1.010		
Journal of Chinese Economic and Foreign Trade Studies	3	0	Emerald Publishing	2.3	0.345	0.817		
International Journal of Health Care Quality Assurance	3	49	Emerald Publishing	4.0	0.529	0.742		
Cogent Business and Management	3	9	Cogent OA	3.5	0.524	1.031		

Notes: TNP = total number of publications; TC = total citations; SJR =; and SNIP =.

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Ranks	Authors	Title	Year	TC	C/Y
1	Zuraik, A., & Kelly, L.	The role of CEO transformational leadership and	2019	116	5.75
		innovation climate in exploration and exploitation			
2	Muhammed, S., & Zaim, H.	Peer knowledge sharing and organizational	2020	76	3.76
		performance: The role of leadership support and			
		knowledge management success			



### (MOJEM)

3	Uyar, A., Kilic, M., Koseoglu, M. A., Kuzey, C., & Karaman, A. S.	The link among board characteristics, corporate social responsibility performance, and financial performance: Evidence from the hospitality and tourism industry	2020	70	3.47
4	Nekhili, M., Chakroun, H., & Chtioui, T.	Women's leadership and firm performance: Family versus nonfamily firms	2018	69	3.42
5	Aldamen, H., Hollindale, J., & Ziegelmayer, J. L.	Female audit committee members and their influence on audit fees	2018	53	2.63
6	Javed, B., Khan, A. K., & Quratulain, S.	Inclusive leadership and innovative work behavior: Examination of LMX perspective in small capitalized textile firms	2018	52	2.58
7	Hossain, M., Atif, M., Ahmed, A., & Mia, L.	Do LGBT workplace diversity policies create value for firms?	2020	50	2.48
8	Jin, S. V., & Ryu, E.	Instagram fashionistas, luxury visual image strategies and vanity	2020	47	2.33
9	Dwekat, A., Seguí-Mas, E., Tormo-Carbó, G., & Carmona, P.	Corporate governance configurations and corporate social responsibility disclosure: Qualitative comparative analysis of audit committee and board characteristics	2020	45	2.23
10	Zaid, M. M. A., Wang, M., Abuhijleh, S. T. F., Issa, A., Saleh M. W. A., & Ali, F.	Corporate governance practices and capital structure decisions: The moderating effect of gender diversity	2020	44	2.18

*Note: TC = total citations; C/Y = citations per year* 

Å VOSviewer



Figure 10. Network Visualization Map of Co-authorship in Women's Research

Figures 10 and 11 provide a visual representation of the co-authorship network and international collaboration map, respectively.





Figure 11. International Visualization Map of Co-authorship in Women's Research

These network visualizations testified to the collaborative spirit permeating the research community, with crossborder partnerships bolstering the field's advancement.

This study attempted to gain an insightful perspective on the publication trends of women's leadership research in the Arab context using bibliometric analysis. These findings complement existing subjective and evaluative reviews on the academic publication trends on women's leadership with a clear focus on Arab women's leadership.

#### DISCUSSION

This bibliometric review examines the literature on Arab women's leadership from 2018 to 2022. By highlighting and examining the growing literature on this topic, this study would serve as an important effort to track the progress of gender equality through the lens of women's leadership. This study yielded 188 publications, indicating a rising interest expected to grow worldwide. This is because, globally, more research institutes are encouraging intercultural, contextualized, and interdisciplinary collaboration on gender equality and women's leadership (Abalkhail, 2017; Alghofaily, 2019). To bring scholarly attention to the global trend toward gender parity in leadership roles, more bibliometric analysis attempts with an emphasis on women's leadership are required.

Within geographically distributed scholarly production, the United Arab Emirates has emerged as the most active women's leadership literature writer. Its publications have received a significant number of citations, more than Saudi Arabia (Brabazon & Schulz, 2020). This finding aligns with the view of Hilal et al. (2024), who pointed out the imbalance in the geographic distribution of Arab female leadership scholarship. Interestingly, despite having fewer publications, the United States has the highest citation impact, demonstrating the quality and significance of its contributions (Teague, 2015). Within academic institutions, Zayed University has emerged as the core of this subject research, with Qatar University close behind, notably in citation effect (Alghofaily, 2019).

Hirsch (2005) highlights a relationship between the age of academic works and their citation counts. This pattern implies that older works receive more citations over time, increasing their impact in their respective fields. This bibliometric analysis supports these findings, showing a continuous increase in citation frequency over time.



Notably, Koburtay, T. and Syed, J., affiliated with the University of Petra and Lahore University of Management Sciences, have produced four well-cited works, highlighting the field's global reach and collaborative nature. This finding resonates with Bornmann et al.'s (2012) study that citation count is one of the vital indicators used in appraising scientific papers and is also considered a sign of a paper's potential.

Bradford's law, a key bibliometric principle, states that a small core number of journals contribute significantly to the majority of literature on a given topic (Bradford, 1934). Our data support this principle, with journals such as 'Journal of Business Ethics' and 'Corporate Governance (Bingley)' setting the standard for publishing and citation counts. This highlights the critical role Emerald Publishing plays in advancing research on Arab women's leadership.

The most cited articles in our review cover a variety of women's leadership research, with Zuraik and Kelly's (2019) significant article on CEO transformative leadership establishing a benchmark for future research. Muhammed and Zaim's (2020) work on knowledge sharing and organizational performance, as well as Uyar et al. 's (2020) exploration of board characteristics and corporate performance, highlight the field's diverse yet interconnected themes.

Keywords are the compass points of academic exploration, guiding researchers to the salient literature in their quests for knowledge. The recurring terms 'Gender', 'Leadership', 'Corporate Governance', and 'Women' signal the thematic pillars underpinning the current research landscape (Brabazon & Schulz, 2020).

The major findings of this study show that the number of publications on Arab women's leadership has continued to grow within the selected timeframe. The United Arab Emirates was the largest contributor to the area of research focus, while the most published journal is the International Journal of Leadership in Education. Zayed University in the United Arab Emirates is considered a good candidate for collaborative research because it recorded the highest number of publications.

Novelty factors comprise representative recombination of the keywords, references and topics. In this study, the novelty is the use of bibliometric analysis methods to measure the development of international articles on women's leadership from 2018 to 2022 in journal publications. Thus, the topic of Arab women's leadership can be used as a novelty for research and could become a trend in future.

While this study offers a comprehensive glimpse into the scholarly dialogue on women's leadership, it is limited by the exclusive use of Elsevier's Scopus database and the limitation to English language publications, potentially omitting significant contributions indexed elsewhere or published in other languages (Alghofaily, 2019).

#### CONCLUSION

This study highlights the United Arab Emirates' leading contribution to the body of knowledge on women's leadership, with Saudi Arabia acknowledged for its significant contribution. The study aimed to thoroughly synthesize current research regarding women's leadership trends in Arab countries and to make a valuable contribution to leadership and management practices. This study used bibliometric analysis of 188 publications to examine leadership trends and patterns among Arab women. The data shows that there has been an increasing trend of research on this topic, with the majority of studies coming from Arab countries such as the United Arab Emirates, Saudi Arabia, and Jordan. This suggests that attention is given to the importance and benefits of incorporating women into leadership roles and promoting gender equality. Over time, it has been discovered that this serves as an antecedent for the growth of equality, diversity, and inclusivity within organizations. More research can, therefore, examine a wider variety of organizational factors that may arise from the leadership of Arab women. It is also possible to compare and contrast Arab nations with other regions to identify disparities in equity, inclusiveness, and women's leadership roles. Additionally, it is possible to look at the effects of these trends on organizational and managerial aspects.



The 'International Journal of Leadership in Education' continues to be the quintessential outlet for research dissemination in this domain. Zayed University is posited as a beacon for future collaborative research endeavours, fostering a deeper understanding of Arab women's leadership (Koburtay, T.; Syed, J.). Since academic journals could provide a limiting view of women's leadership in the Arab region, to have a more balanced perspective of the region and to add more value to the research, a wider research and publication context should be reviewed.

The description of the trajectory studies on Arab women's leadership has taken in the last couple of years contributes to leadership and management practices as it shows relevant information on this field of study. The study provides readers with a broad and complete view of the field through analyses, tables and data interpretation from the field of study (growth of publications, patterns, collaboration, prolific authors, country contributions, most active institutions, preferred journals, and top-cited articles). Additionally, for leadership and management implications, leaders and managers should advance in adopting more technological resources to expand the quality and number of research conducted and published on women's leadership in the Arab region and other regions.

#### **CONFLICT OF INTEREST**

The authors declare that they have no conflicts of interest.

#### AUTHOR CONTRIBUTIONS

Conceptualization, Khadijah M. H. Alrashidi and Aziah Ismail; methodology, Khadijah M. H. Alrashidi and Aziah Ismail; software, Khadijah M. H. Alrashidi; validation, Khadijah M. H. Alrashidi and Aziah Ismail; formal analysis, Khadijah M. H. Alrashidi; investigation, Khadijah M. H. Alrashidi; resources, Khadijah M. H. Alrashidi and Aziah Ismail; data curation, Khadijah M. H. Alrashidi; writing—original draft preparation, Khadijah M. H. Alrashidi; writing—review and editing, Khadijah M. H. Alrashidi and Aziah Ismail; visualization, Khadijah M. H. Alrashidi; supervision, Aziah Ismail; project administration, Aziah Ismail.

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