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Understanding physicians' journeys with corticosteroids: Experiences, knowledge, and the shadows of fears

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ABSTRACT

Background: Corticosteroids (CS) are essential in managing various medical conditions; however, long-term use presents significant risks. Balancing therapeutic benefits with potential hazards requires careful prescription and monitoring. This study evaluates Jordanian physicians' knowledge, experiences, and concerns regarding CS prescriptions and identifies predictors of both knowledge and fear.

Methods: A cross-sectional study was conducted from March to August 2023 using an online survey dis-tributed via social media platforms. Descriptive statistics and linear regression analyses were employed to assess factors influencing physicians' knowledge and fears regarding CS.

Results: A total of 171 physicians participated, with a median age of 31 years (IQR = 8.0). The majority (86.5%) had prescribed topical (83.1%) and injectable (81.1%) CS formulations. Physicians demonstrated high knowledge (median score: 11/11) but expressed significant concerns (median fear score: 3.5/5), particularly about osteoporosis (73.7%) and hyperglycemia (66.7%). Regression analysis revealed that specialization in rheumatology was significantly associated with higher knowledge scores ($p = 0.027$). Conversely, higher knowledge scores were associated with lower fear scores ($p = 0.034$), while other sociodemographic factors did not significantly impact either knowledge or fears.

Conclusion: Jordanian physicians possess substantial knowledge about CS; however, significant concerns remain regarding side effects such as osteoporosis and hyperglycemia. Specialty and knowledge level are key factors influencing both knowledge and fear. These findings highlight the need for targeted educa-tional interventions to address these concerns, improve physician confidence, and enhance patient management outcomes.

Introduction

Corticosteroids (CSs) are essential in managing a wide range of medical conditions, particularly those involving inflammation and immune-mediated disorders (1, 2). Their pharmacological benefits, including symptom reduction, disease severity alleviation, and quality of life improvement, make them invaluable in clinical practice (3). However, the long-term use of CSs is associated with significant risks, such as infections, osteoporosis, hyperglycemia, cardiovascular diseases, and immunosuppression (1, 4). Therefore, it is imperative to carefully weigh the therapeutic benefits against these potential hazards before prescribing corticosteroids (2).

To ensure safe and effective CS use, healthcare providers must select the appropriate drug, dosage, and treatment duration, considering each patient's medical history and other relevant factors (5). Regular monitoring of side effects and timely adjustments to treatment plans are also crucial in minimizing potential harm. Effective communication and education between patients and healthcare providers play a vital role in optimizing therapeutic outcomes and reducing risks (5, 6). This collaborative approach extends to the relationship between physicians and pharmacists, where each profession's unique expertise contributes to safer and more effective patient care (7). Physicians provide the clinical knowledge necessary for prescribing and monitoring CSs, while pharmacists enhance patient education, ensure the correct dispensing of medications, and monitor for drug interactions (8, 9). This integrated approach is essential for delivering comprehensive care that minimizes toxicity and improves patient outcomes.

Despite the recognized importance of corticosteroids in medical practice, existing literature highlights gaps in knowledge, experience, and monitoring practices among healthcare providers. For example, a study revealed that less than one-third of patients received regular clinical and biological monitoring prior to initiating CS therapy, indicating a deficiency in prescribers' awareness of potential risks (16). Additionally, international research offers mixed findings: while Korean community pharmacists were found to have adequate knowledge to advise patients on CS use (17), an Egyptian study revealed insufficient knowledge and suboptimal practices among pharmacists regarding CS management in asthma (18). These disparities underscore the need for targeted educational efforts to enhance prescription accuracy, appropriateness, and adherence to clinical guidelines.

Understanding physicians' awareness, experience, and concerns about corticosteroid use is critical for improving prescribing practices and addressing any psychological barriers that may impede the safe and effective use of these drugs (13, 5). The scarcity and inconsistency of existing research on healthcare professionals' perceptions of CSs highlight a significant gap in the literature that must be addressed to improve patient care. Given this context and the limited data on knowledge, experience, and fears regarding CSs among healthcare workers, this study aims to assess the knowledge, experiences, and concerns of Jordanian physicians regarding corticosteroid prescriptions.

Materials and Methods

An online questionnaire was employed in this cross-sectional investigation. Data was gathered between March and August 2023, using social media such as Facebook, LinkedIn, and WhatsApp. The questionnaire was intended to be a self-administered tool. Licensed physicians practicing in Jordan and able to understand English were eligible to participate in the study. Participation was voluntary and anonymous. Study details and an online consent form were provided at the beginning of the questionnaire, allowing participants to proceed if they agreed. The Faculty of Pharmacy, Applied Science Private University, Amman, Jordan's Institutional Review Board (or Ethics Committee) has obtained ethical approval (Approval number: 2022-PHA-24).

Sample size

The sample size has been calculated using Open-Source Epidemiologic Statistics for Public Health (OpenEpi) Version 3.01, with a margin of error of 5% and a confidence level of 90%. The approach of practical snowball sampling was employed to recruit participants. For this study, considering that there are 42,364 registered physicians in Jordan [20] and a 95% confidence interval, the minimal sample size needed is 170 participants (19).

Study tool

The study questionnaire was developed utilizing the essential principles for efficient survey design (20),and based upon previous validated surveys in the literature (21-24). Combining data from multiple sources resulted in a pool of questions relevant to the objectives of the study. Five academics assessed the content validity of the study tool prepared in English. The questionnaire was piloted on 10 participants (physicians) to ensure the clarity of all items, and linguistic adjustments were made as necessary based on the participants' feedback. The final analyses did not take the pilot responses into account. Then, the final version of the questionnaire was distributed electronically. Cronbach's alpha was also checked (=0.85), accordingly the scale's reliability and internal consistency were confirmed.

The questionnaire comprised four sections with multiple choice questions: section I comprised of sociodemographic characteristics (5 questions), section II included the assessment of knowledge about CS (11 questions), section III covered the experience with CS prescription (5 questions), and section IV assessed fears and preferences toward CS prescription (10 questions).

Regarding the 11 knowledge assessment items were used to compute the cumulative knowledge score. Physicians received 1 point for each correct answer and 0 points for each incorrect answer, resulting in a knowledge score that can range from 0 to 11. Additionally, participants' responses regarding the fear score were documented using a Likert scale with a maximum of five points, with options including "strongly disagree" (1), "disagree" (2), "neutral" (3), "agree" (4), and "strongly agree" (5).

Statistical analyses

Data were extracted from Google Forms as an Excel sheet and were then exported to Statistical Package for Social Sciences version 25.0 (IBM SPSS Statistics for Windows, version 25 (IBM Corp., Armonk, N.Y., USA) for statistical analysis. The descriptive analyses were conducted using median and Interquartile Range (IQR) for continuous variables and frequency and percentages for categorical variables. Univariate linear regression analysis investigated independent factors that may affect the participants' knowledge and fears about CS. Variables were selected after checking their independence, where tolerance values > 0.1 and Variance Inflation Factor (VIF) values < 10 were checked to indicate the absence of multicollinearity between the independent variables in regression analysis. Variables that were found to be significant on a single predictor level ($p < 0.25$) were entered into multiple linear regression analyses. None of the included variables showed multicollinearity; thus, none was eliminated. Statistical significance was considered at $p \leq 0.05$.

Results

Sociodemographic characteristics of the study participants

In this research, 171 physicians volunteered to participate. Their median age was 31.0 years, with an interquartile range of 8.0. Most were male, accounting for 105 individuals (61.4%), and nearly two-thirds were working in central Jordan, totaling 111 participants (64.9%). In terms of their medical specialties, the majority were rheumatologists (n=75, 43.9%) and approximately one-third of the physicians were general practitioners (GPs) (n= 64, 37.4%).Further information on their sociodemographic characteristics can be found in Table 1.

Table 1. Socio-demographic characteristics of the study respondent (n= 171)
IQR: interquartile range

Parameter	Median (IQR)	n (%)
Age (years)	31.0 (8.0)	
Gender **Males** **Females**		 105 (61.4) 66 (38.6)
Physicians site of work **Hospital** **Private clinic** **Health center** **Others**		 94 (55.0) 25 (14.6) 40 (23.4) 12 (7.0)
Location of work **North of Jordan** **Center of Jordan** **South of Jordan**		 45 (26.3) 111 (64.9) 15 (8.8)
Physicians specialty **GP (General practitioner)** **Family medicine** **Dermatology** **Gastroenterology** **Hematology-Oncology** **Nephrology** **Neurology** **Psychiatry** **Pulmonology** **Rheumatology** **Others**		 64 (37.4) 21 (12.3) 3 (1.8) 1 (0.6) 2 (1.2) 1 (0.6) 1 (0.6) 1 (0.6) 1 (0.6) 75 (43.9) 3 (1.8)

Physicians' experience with prescribing corticosteroids

Regarding the experience of physicians in prescribing CS, as indicated in Table 2, a significant majority of them, totaling 148 individuals (86.5%), reported having such experience. Among those who had dispensed CS, the most frequently prescribed dosage form was topical (123 out of 148, 83.1%), followed by injectable forms (121 out of 148, 81.8%). Furthermore, the primary reasons for physicians prescribing CS were related to treating respiratory diseases (129 out of 148, 87.2%), followed by dermatological conditions (122 out of 148, 82.4%). Additionally, the most prevalent side effects of CS experienced by patients, as reported by the physicians, included hyperglycemia (84 out of 148, 56.8%), increased appetite (82 out of 148, 55.4%), and high blood pressure (62 out of 148, 41.9%).

Physicians reported the main reasons for choosing to prescribe CS to their patients. First and foremost, the ability of CS to rapidly alleviate patients' symptoms was a major factor, with 113 out of 148 physicians (76.4%) identifying this as a key consideration. Additionally, many physicians noted that CS were deemed the most effective treatment options for their patients' conditions, aligning with recommendations found in treatment guidelines, as reported by 102 out of 148 physicians (68.9%). Additional reasons can be found in Figure 1.

Physicians' knowledge about corticosteroids

Overall, physicians demonstrated a high level of knowledge about CS, as indicated in Table 3. Their median knowledge score was 11.0 out of a maximum of 11.0, with an IQR of 1.0. The majority of physicians were well-informed, with 170 out of 171 (99.4%) correctly recognizing that CS can lead to weight gain. Additionally, 168 out of 171 physicians (98.2%) were aware that prolonged treatment with high doses of CS could pose problems for certain individuals. Furthermore, 167 out of 171 (97.7%) understood that when discontinuing long-term CS use, the doses should be reduced gradually over several weeks or months.

Table 2. Physicians' experience with corticosteroids (n= 171)

Questions	n (%)
Have you ever prescribed corticosteroids for any reason?	
Yes	148 (86.5)
No	15 (8.8)
Maybe	8 (4.7)
The dosage form of corticosteroids you have prescribed$	
Topical (e.g., cream or ointment)	123 (83.1)
Inhaler or nebulizer	114 (77.0)
Tablets	110 (74.3)
Injection	121 (81.8)
Drops (e.g., eye drops)	69 (46.6)
The indication for corticosteroid you have prescribed$	
Respiratory disease (e.g., Asthma, COPD)	129 (87.2)
COVID-19	92 (62.2)
Dermatological disease (e.g., eczema)	122 (82.4)
Joint or rheumatological diseases	62 (41.9)
GIT immunological diseases (e.g., Crohn's disease)	41 (27.7)
Systemic immunological disorders (e.g., Multiple Sclerosis)	50 (33.8)
Did you ever experience any of the following side effects with your patients?$	
Increased appetite – potentially leading to weight gain	82 (55.4)
Acne	41 (27.7)
Thinned skin that bruises easily	35 (23.6)
Increased risk of infections	59 (39.9)
Mood changes, mood swings, and depression	59 (39.9)
Hyperglycemia	84 (56.8)
High blood pressure	62 (41.9)
Osteoporosis (weak and brittle bones)	33 (22.3)

$ Percentages calculated out of 148

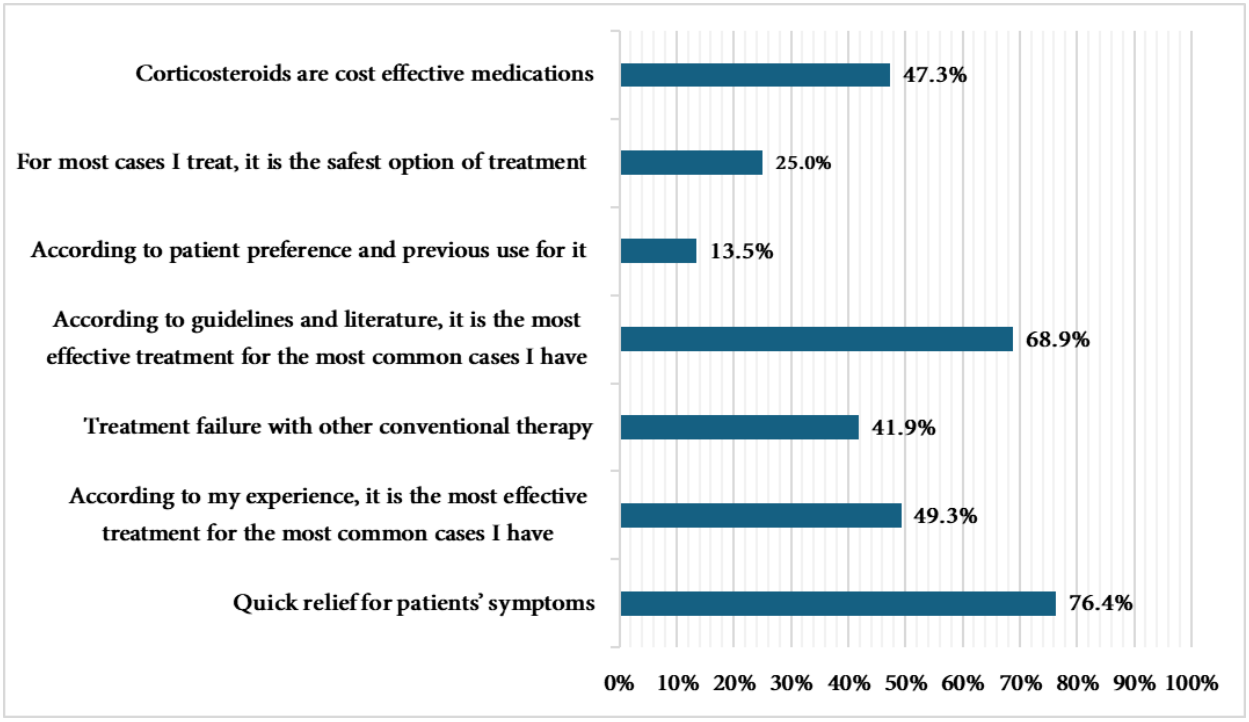


Figure 1. Reasons why physicians choose corticosteroids for the treatment (Percentages calculated out of 148).

Table 3. Physicians' knowledge about corticosteroids medications (n= 171)

Statement	Percentage of patients correctly answered n (%)
Corticosteroids, often known as steroids, are anti-inflammatory medicine.	156 (91.2)
Corticosteroids are man-made hormones normally produced by the adrenal glands.	154 (90.1)
Corticosteroids are mainly used to reduce inflammation and suppress the immune system.	162 (94.7)
Corticosteroids are used to treat various health conditions (e.g., asthma, eczema, COVID-19 etc.)	163 (95.3)
Prolonged steroid treatment at high doses – particularly with steroid tablets – can cause problems in some people.	168 (98.2)
The used dose needs be reduced slowly over few weeks or months before stopping corticosteroids if have been taking them long time.	167 (97.7)
Corticosteroids can cause weight gain	170 (99.4)
Corticosteroids can cause thinned skin that bruises easily	154 (90.1)
Corticosteroids can cause increased risk of infections	161 (94.2)
Corticosteroids can cause mood changes	143 (83.6)
Corticosteroids can cause high blood glucose	151 (88.3)
Knowledge score (out of 11), median (IQR)	

Physicians' fears toward corticosteroids prescribing

Physicians displayed a high fear score with a median score of 3.5 out of a possible 5.0 (IQR= 0.8) concerning the prescribing of CS, as shown in Table 4. The primary concerns that physicians had when it came to prescribing CS were related to the risk of osteoporosis in their patients, with 126 out of 171 (73.7%) expressing this fear, as well as the risk of hyperglycemia, which was a concern for 114 out of 171 (66.7%) physicians. Additionally, physicians were apprehensive about the potential risk of elevated blood pressure among their patients, with 108 out of 171 (63.2%) indicating this as a source of fear.

Table 4. Fears toward corticosteroids prescription among study participants (n= 171)

I am afraid to prescribe corticosteroids due to…….	Percent agreed/strongly agreed
Risk of weight gain among my patients	100 (58.5)
Risk of hyperglycemia among my patients	114 (66.7)
Risk of increased blood pressure among my patients	108 (63.2)
Risk of osteoporosis among my patients	126 (73.7)
Risk of patient's addiction to this medication and not being able to live without it	73 (42.7)
Risk of developing adrenal insufficiency after stopping the corticosteroids among my patients	85 (49.7)
Dosage form (oral and injectable) more than the	100 (58.5)
Risk of patient's-social refusal if they know about	92 (53.8)
Risk of depression of mood swings among my	72 (42.1)
Risk of any unknown/untreatable side effects	77 (45.0)
*Fears score, median (IQR)	3.5 (0.8)

* (1.00-1.66): Low score on the Likert scale, (1.67-3.32): Moderate score on the Likert scale, (3.33-5.00): High score on the Likert scale.

Predictors of factors affecting physicians' knowledge about corticosteroids

The linear regression analysis to determine the predictors of physicians' knowledge about corticosteroids (CS) showed that the only significant predictor was the physicians' specialty. Rheumatologists were significantly more knowledgeable compared to other specialists (p = 0.027). The analysis revealed that other sociodemographic factors, such as age, gender, site of work, and location of work, were not significantly associated with higher knowledge scores. The table below summarizes the regression results for knowledge.

Table 5. Assessment of factors associated with participants' knowledge about corticosteroids (n= 171)

Parameter	Knowledge score			
	Beta	P-value#	Beta	P-value$
Age (years) (median (IQR)	0.157	0.040^	0.131	0.096
Gender Males Female	Reference -0.141	0.065^	0.110	0.162
Site of work Hospital setting Others	Reference -0.015	0.841	---	---
Location of work Center of Jordan Others	Reference -0.007	0.927	---	---
Physician specialty				
Rheumatology Others	Reference 0.221	0.027	-0.042	0.044

#using simple linear regression, $ using multiple linear regression, ^ eligible for entry in multiple linear regression. Bold numbers represent significant values P-value<0.05.

Predictors of factors affecting physicians' fears towards corticosteroids

Regarding the regression analysis for the factors associated with physicians' fears of prescribing corticosteroids, the findings indicated that knowledge score was the only significant predictor. Physicians with higher knowledge scores were found to have significantly lower fear scores (p = 0.034). Other sociodemographic factors, including age, gender, site of work, and location of work, did not significantly affect the level of fear.

Table 6. Assessment of factors associated with participants' fears from corticosteroids

Parameter	Fear score			
	Beta	P-value#	Beta	P-value$
Age (years) (median (IQR)	-0.112	0.145	---	---
Gender Males Females	Reference 0.030	0.694	---	---
Residence area Urban Rural	Reference 0.074	0.337	---	---
Physicians site of work Community pharmacy Others	Reference 0.000	0.999	---	---
Location of work Center of Jordan Others	Reference 0.029	0.706	---	---
Knowledge score				
High score Mild and moderate scores	Reference -0.321	0.034	-0.721	0,041

#using simple linear regression, $ using multiple linear regression. Bold numbers represent significant values P-value<0.05.

Discussion

This study provides critical insights into Jordanian physicians' knowledge, experiences, and fears regarding the prescription of corticosteroids (CS). The findings reveal a high level of knowledge among the physicians, which aligns with international standards, but also a considerable level of concern about the potential side effects of CS, such as osteoporosis, hyperglycemia, and hypertension. The significance of these results lies in the understanding that, while knowledge levels are high, the persistent fears indicate underlying concerns that may influence prescribing behaviors. These concerns could potentially lead to hesitation in prescribing CS, even when clinically indicated, thus impacting patient outcomes.

One of the notable contributions of this study is the identification of a link between physicians' knowledge and their fears concerning different dosage forms of CS. While physicians demonstrated high knowledge across various forms of CS, their fears were particularly pronounced with systemic forms (oral and injectable), which are more likely to cause severe side effects (1, 4, 9). This finding is crucial because it highlights the need for targeted educational interventions that not only reinforce the safety and efficacy of topical and inhalable forms but also address the specific fears related to systemic use. Such interventions could enhance physician confidence in prescribing these forms, when necessary, thereby improving patient care (25, 26). As well, the regression analysis identified important predictors of both knowledge and fear regarding CS. Notably, rheumatology specialization was significantly associated with higher knowledge scores ($p=0.027$). This suggests that rheumatologists, likely due to their frequent use of CS in managing inflammatory and autoimmune conditions, are better equipped with the necessary knowledge to prescribe these medications safely. In contrast, age, gender, and practice location did not significantly influence knowledge.

When examining fears surrounding CS prescriptions, knowledge played a critical role. Physicians with higher knowledge scores reported significantly lower levels of fear ($p=0.034$), indicating that increased knowledge may help to alleviate concerns about the side effects of CS. However, sociodemographic factors such as age, gender, and practice location had no significant impact on fear levels. This highlights the importance of targeted educational interventions aimed at improving physicians' knowledge to reduce unnecessary concerns and ensure appropriate CS use (5). Furthermore, this study's findings underscore the importance of regular monitoring and continuous professional development (CPD) in mitigating fears and ensuring that knowledge translates into practice. The observed disconnect between high knowledge and significant fear suggests that while CPD effectively enhances knowledge, it may not fully address the psychological barriers to prescribing CS (5, 10). This highlights a gap in current educational practices, where more emphasis should be placed on strategies to manage fears and misconceptions about CS side effects (27).

In the context of the broader challenges outlined in the introduction, this study contributes to the ongoing discussion about the safe and effective use of CS in clinical practice. The identification of specific fears associated with different CS dosage forms provides a new perspective that could inform the development of more nuanced and effective educational programs. These programs should aim to bridge the gap between knowledge and practice, ensuring that physicians are not only informed but also confident in their ability to prescribe CS without undue fear of adverse outcomes (11, 14, 17).

Overall, this study adds to the existing literature by providing a detailed examination of the factors that influence CS prescribing practices among Jordanian physicians. By addressing both knowledge and fear, this research offers a more comprehensive understanding of the challenges faced in CS management. Future studies should build on these findings by exploring the effectiveness of targeted educational interventions in reducing fear and improving prescribing confidence, ultimately leading to better patient outcomes (16, 19, 22).

Implications of the Study

The implications of this study are significant for both clinical practice and healthcare education. The high levels of fear observed among physicians, particularly regarding systemic CS forms, suggest the need for more focused educational interventions that not only provide information but also address the emotional and psychological concerns associated with these medications. Enhancing physician confidence through targeted training could lead to more consistent and effective CS use, ultimately improving patient outcomes (28). Additionally, the study underscores the importance of continuous professional development (CPD) in maintaining up-to-date knowledge among healthcare providers, suggesting that CPD programs should include components that specifically address the management of fears and misconceptions about CS (29).

Moreover, this study provides valuable insights for policymakers and healthcare administrators in Jordan and similar contexts. By understanding the barriers to optimal CS prescribing, strategies can be developed to support physicians through guidelines, resources, and training programs that address both knowledge gaps and emotional barriers. This, in turn, could lead to more effective management of conditions that require CS therapy and better overall healthcare outcomes.

Limitations of the Study

Despite its contributions, this study has several limitations that should be acknowledged. First, the cross-sectional design of the study provides a snapshot of physicians' knowledge and fears at a single point in time, which limits the ability to infer causality or changes over time. Second, the study relied on self-reported data, which may be subject to bias, including social desirability bias, where participants might overstate their knowledge or understate their fears. Third, the study was conducted using an online survey distributed via social media, which may have led to a selection bias, as it might not fully represent all Jordanian physicians, especially those less active on social media platforms. Additionally, the sample size, while adequate for the analyses conducted, may limit the generalizability of the findings to the broader population of physicians in Jordan (30).

Future research should consider longitudinal designs to track changes in knowledge, experiences, and fears over time, and include larger, more diverse samples to enhance the generalizability of the findings. Furthermore, qualitative studies could provide deeper insights into the underlying reasons behind physicians' fears and how these fears influence their clinical decision-making.

Conclusions

This cross-sectional study sheds light on Jordanian healthcare physicians' knowledge, experiences, and fears regarding corticosteroid prescriptions. With a diverse sample, the study reveals a prevalent use of corticosteroids, primarily for respiratory and dermatological conditions. Despite the high fears of side effects, including osteoporosis, hyperglycemia, and hypertension, physicians remain willing to prescribe corticosteroids when deemed the optimal treatment. Moreover, the study underscores the high knowledge level of Jordanian physicians, attributed to mandatory continuing professional development. Finally, this research emphasizes the critical role of ongoing medical education in fostering physicians' confidence and knowledge. The insights gained can inform targeted interventions to address concerns and optimize corticosteroid use in Jordan's healthcare landscape.

Author Contributions:

Muna Barakat: Concept and Design, Data Acquisition, Data Analysis, Manuscript Drafting, Approval of Final Version. Rana Abufarha: Concept and Design, Data Acquisition, Data Analysis, Manuscript Drafting, Approval of Final Version. Samar Thiab: Concept and Design, Data Acquisition, Data Analysis, Manuscript Drafting, Approval of Final Version. Nesreen Salim: Data Acquisition, Manuscript Drafting, Approval of Final Version. Anas O. Alshweiki: Concept and Design, Data Acquisition, Manuscript Drafting, Approval of Final Version. Diana Malaeb: Manuscript Drafting, Approval of Final Version. Malik Salam: Manuscript Drafting, Approval of Final Version. Roa'a Thaher: Data Acquisition, Data Analysis, Manuscript Drafting, Approval of Final Version.

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Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board (or Ethics Committee) of Faculty of Pharmacy, Applied Science Private University, Amman, Jordan (Approval number:2022-PHA-24)

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data will be made available by the corresponding author upon request.

Conflicts of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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