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ORIGINAL PAPER

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Public Awareness of Corticosteroid Use and Side Effects: a Cross-Sectional Study from Jordan

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ABSTRACT

Background: Corticosteroid usage is very widespread these days. However, the way corticosteroids are administered, the side effects of the drug and the risks associated with its usage are not widely known. **Objective:** The authors evaluated the responses of a diverse group who were aware of the methods of corticosteroid administration, side effects and information provided by the health care provider. To assess the awareness level and identify the gaps in knowledge descriptive statistics were used. **Methods:** The study was a cross sectional online survey conducted during July and December of 2024 using non-probability convenience sampling. A collection of queries were used to test knowledge of steroids as well as its effects. The sample included Jordanians aged 18 and above. The data was analyzed using logistic regression and chi-square with the SPSS (version 27). **Results:** From the participants, it was seen that 39.8% used corticosteroids. The most recognized were the oral (81%) and intravenous (60.9%). Most commonly noticed side effects were weight gain (81%) and mood swings (45.9%), rare ones being anemia (7%) and epilepsy (4.3%) were less known. There was high awareness about corticosteroid use in respiratory illnesses like asthma (71%) and autoimmune conditions like rheumatoid disease (64%), but awareness about their use in metabolic and oncological diseases was limited. Only 40.9% of participants said that side effects info was provided to them. **Conclusion:** There were significant gaps in community awareness which might compromise the therapeutic utility of corticosteroids.

Keywords: Corticosteroid awareness, side effects, healthcare communication, administration methods, patient education

1. BACKGROUND

The increasing accessibility of corticosteroids makes understanding public awareness of their therapeutic use and side effects imperative (1). The present study provides an exploration of the public knowledge of benefits and risks of corticosteroid use among the Jordanian Public. The association of demographic characteristics with knowledge and awareness of corticosteroids was also investigated (2). Corticosteroids are frequently prescribed for their anti-inflammatory effect and are commonly used to treat inflammatory disorders (2). Many people who are prescribed corticosteroids are either unaware or have inadequate information about its side effects (3). Increased awareness would enable individuals to better recognize many of the risks associated with their use and may also prompt further inquiries as to their appropriate use with healthcare professionals (3). An informed public will be better equipped to mitigate any potential risks that might result from corticosteroid misuse (4). The improvement of knowledge regarding corticosteroid use and its side effects, such as the possibility of Cushing's syndrome and the potential for withdrawal following long-term use, may also lead to enhanced health and health outcomes (5).

Interpreting public awareness of objectives, benefits, and side effects of corticosteroid treatment could enhance the public health impact (6). There has been a need for medication management to deal with non-communicable diseases, cancer, and a variety of transplant rejection responses or autoimmune diseases (7). Corticosteroids have various negative effects, including osteoporosis, maculopathy, glucose, psychosis, and infections (8). It might also weaken body immunity from vaccines by intake of systemic corticosteroids (9).

Corticosteroids are synthetic hormones directly derivative from the main hormone in this category, cortisol (10). They can imitate the effects of cortisol when the body fails to produce enough (11). Natural cortisol controls various functions in the body, such as the immune system's activity, metabolism, inflammation, and electrolyte balance (12). Corticosteroids are employed to suppress the immune system and inflammation as they can prevent the body from responding to stressors, mainly by blocking the immune system's activity when needed (13). They are often prescribed when an inflammatory process has become too severe and is causing too much damage, such as in severe asthma attacks (14). Their use can also be palliative in conditions where inflammation or immune suppression can bring symptom improvement, such as in auto-immune conditions like lupus (2). Different corticosteroids can be taken via oral route, intramuscular injections, inhaled, topical creams, and eye drops. Each method has its advantages and disadvantages (15). Self-medication with oral corticosteroids especially is of particular concern in Jordan since they are prescribed without healthcare practitioners' (HCPs) prescription and can be purchased over the counter in Jordan's pharmacies (16).

Corticosteroids are available in different dosage forms and registered under multiple brands, making them highly accessible by consumers (17). Such rising public handling and administration of ADA without prescription or following any relevant guidelines have serious risks including delayed diagnosis and treatment of serious conditions, adverse drug reactions, drug abuse, the masking of serious diseases, and potential new disease generation (18). A growing body of evidence across different Middle East countries ceases to this inappropriate use as unjustifiable concerns, just simple medications needed for well-being, or inadequate information (19).

Corticosteroids can be prescribed as powerful anti-inflammatory therapeutic medications used for the treatment of a wide variety of disorders (20). They are associated with some side effects that are mostly related to the dose used and duration of treatment (21). Many people are afraid of using corticosteroids despite their therapeutic benefit (22). During the COVID-19 pandemic, there were many reported behaviors regarding medications use among study scales of Middle Eastern countries. A debate on the use of corticosteroids in the treatment of COVID-19 was going on until studies led to recommending corticosteroids among

the COVID-19 treatment guidelines but in certain cases (23). A multinational study was conducted to assess the public knowledge and fears about using corticosteroids among the general public in different Arab countries in the era of COVID-19 (24). Low levels of knowledge regarding corticosteroid side effects among study participants were found, regardless of gender, employment status, or country of residence (25). The fear of side effects is mostly related to weight gain, immunosuppression, and hypothalamic-pituitary-adrenal axis (HPA) suppression (26).

The Generalized Linear Mixed Model (GLIMMIX) test showed that the role of health care providers is crucial in appropriately counseling patients about the correct use of corticosteroids as it can lead to avoid hesitation, misuse, and abuse (2). All corticosteroids have the same side effects (27). Internet accessibility represents the highest significant decreasing source of health information, mainly social media and YouTube (28). Despite the easy accessibility to these platforms, this source is not frequently validated for medical information (29). Healthcare workers, including pharmacists and nurses, were reported to be the least preferred choice for information about corticosteroids among study participants unlike dentists and family physicians (30). Middle Eastern countries' populations reported a lower level of fear about using corticosteroids, mainly those in the Gulf countries (31). The participants born in the Gulf countries reported not to be feared about using corticosteroids (32). Jordan's population were found to have a very good knowledge of the awareness of corticosteroid side effects (33).

2. OBJECTIVE

The main objectives of the present study were to explore the awareness level of using corticosteroid treatments as well as their side effects and the information sources.

3. MATERIAL AND METHODS

Study Design and Settings

The present study was a cross-sectional study conducted online throughout the period of July to Dec 2024. The main objective was to evaluate the extent of public knowledge related to the use of corticosteroids and the associated side effects.

The present study utilized a non-probability convenience sampling method. Data collection was obtained through utilization of an online-based questionnaire which was disseminated via several social media platforms, including Email and Mobile phone Messengers. The hyperlink was shared by the authors inviting people who satisfied the specified criteria for inclusion to engage in the research. In addition, participants were instructed to distribute the study link to their acquaintances and professional contacts.

Sample population

The study population included the Jordanians from age 18 and above. There was no restriction on the participants' gender or income category. Any participants

who lacked mental capacity or did not provide appropriate consent were excluded from the study.

Questionnaire tool

The present investigation utilized a questionnaire tool created by Costello et al. to assess individuals' perceptions of glucocorticoid side effects. The individuals were questioned regarding their demographic characteristics in our questionnaire. Subsequently, an examination was conducted to assess the participants' level of understanding of glucocorticoids and their associated side effects. The questionnaire assessed participants' understanding of the various routes of administration and indications for corticosteroid use. It also inquired about their personal history of corticosteroid-based treatment, knowledge of associated side effects, and whether they received verbal or written information from their healthcare provider regarding the potential adverse effects of corticosteroid treatment. For those who reported prior corticosteroid use, the questionnaire further investigated whether they experienced any side effects during their phases of treatment. Lastly, participants were asked to identify their sources of information pertaining to corticosteroids.

Questionnaire translation

The translation of the questionnaire into the Arabic language was conducted using the forward-backward approach. This approach involved the translator working independently to ensure that the original meaning of the questionnaire items was preserved, rather than relying on a literal word-for-word translation.

Sample size

According to the latest available statistics for 2023, the total population of Jordan is around 10.5 million. Using a confidence interval of 95%, a standard deviation of 0.5, a power of 80%, and a margin of error of 5%, the required sample size was 400 participants. Raosoft sample size estimator was used to estimate the sample size for this study.

Statistical analysis

Categorical variables were presented using frequency and percentage. A binary logistic regression analysis was used to identify predictors of corticosteroid use. The dependent variable in the regression model was defined as the use of corticosteroids and the independent variables were participants' demographic characteristics. Chi-square test was used to compare proportions between users and non-users. A 95% confidence interval ($p \leq 0.05$) was applied to indicate the statistical significance of the results, and a significance level of 5% was assigned. All data were analyzed using the Statistical Package for Social Science software (version 27).

Ethical approval

This study achieved all the required approval steps. All steps were in line with the requirements of the Jordanian Council of Educations and Scientific Research. All patients gave their consent before taking part in this study.

4. RESULTS

Knowledge of the administration method and indication of use of corticosteroids.

Table 1 summarizes the knowledge of respondents on method of administering corticosteroids and its indication for use. We can see the frequency and percentage of participants in each administration method. The key insights are.

a) Oral Administration: 358 respondents (81%) knew this method which is the most recognized.

b) Intravenous Injection: The second most known method, it is known by 269 respondents (60.9%).

c) Intramuscular Injection: 221 respondents know this (50%).

d) Inhalation: 192 respondents (43.4%) are aware of both methods with equal familiarity.

e) Eye Drops: With 172 people aware of them (38.9%).

Variable	Frequency	Percentage
Orally	358	81%
Intravenous injection	269	60.9%
Inhalation	192	43.4%
Intramuscular injection	221	50%
Eye drops	172	38.9%
Articular injection	192	43.4%
Dermal injection	141	31.9%
Rectally	69	15.6%

Table 1. Knowledge of the administration method and indication of use of corticosteroids.

Variable	Frequency	Percentage
Weight gain	358	81%
Skin changes (e.g; bruising, tender skin, stretch marks, redness of face)	217	49.1%
Fluid accumulation in the body with difficulty breathing	206	46.6%
Acne/pimples on the face	176	39.8%
Mood changes	203	45.9%
Heart palpitation and heart attack	116	26.2%
Osteoporosis	203	45.9%
High blood sugar level	195	44.1%
Face roundness	190	43%
Eye diseases (e.g; white water, glaucoma)	120	27.1%
Depression	117	26.5%
Hair loss	107	24.2%
Hypertension	130	29.4%
Diarrhea	42	9.5%
Anorexia	59	13.3%
Infection (e.g; pneumonia)	78	17.6%
Insomnia	89	20.1%
Constipation	48	10.9%
Indigestion	57	12.9%
Cold extremities	37	8.4%
Anemia	31	7%
Decreased daily urination	27	6.1%
Erectile dysfunction	48	10.9%
Memory loss	42	9.5%
Epilepsy	19	4.3%

Table 2. Side effects of corticosteroids

f) Dermal Injection: A method with which 141 respondents (31.9%) were familiar.

g) Rectal Administration: Only 69 respondents (15.6%) knew of this method which is least recognized.

This table shows with corticosteroid administration methods differ from one another in oral and intravenous corticosteroid method are commonly known.

Side effects of corticosteroid treatment

Table 2 lists the side effects resulting from corticosteroids and the percentage of people who noticed or experienced the side effects. Here are the main observations.

Most common side effects

Weight gain was the most commonly reported side effect (81% - 358). Many people also had changes in their skin, such as bruising and redness of their face.

Other prominent side effects

Difficulty Breathing due to Fluid Build-Up: 206 people (46.6%). 203 people (45.9%) noted mood alterations and bone density loss. High sugar Levels: experienced by 195 People (44.1%). 190 people (43%) reported roundness of face.

Moderately reported effects

Spots on the face: noted by 176 persons (39.8%). Glaucoma or cataract and other diseases reported by 120 people (27.1%). The heart palpitation and heart attack were reported by 116 persons (26.2%). 117 people (26.5%) reported depression. Hypertension was experienced by 130 People (29.4%).

Less common side effects

Out of 107 people complained of hair loss. 80 people said that they suffer from insomnia. 78 people have reported infections (e.g. pneumonia). 59 individuals noted anorexia (13.3%). Indigestion was noted by 57 individuals (12.9%). Constipation and E.D. Both About 48 People (10.9%).

Rare side effects

Cold Hands and Feet were reported by 37 Individuals (8.4%). Anemia was reported by 31 Individuals (7%). Less Frequent Urination was reported by 27 individuals (6.1%). Only 19 Patients (4.3%) reported epilepsy.

This table shows that corticosteroid side effects are very common (weight gain, skin changes) to rare (epilepsy, anemia). Many have cited various side effects of corticosteroids.

Community's awareness of side effects of corticosteroids

Table 3 assesses community knowledge of conditions which may be related to the use of corticosteroids or the effects which are associated with this. The table shows what the respondents don't know and what they do know; this is the degree of knowledge about conditions. Key observations include:

High awareness conditions

The responses given to this question revealed that the maximum percentage was for asthma. This is due to corticosteroids being commonly used for respira-

Variable	Frequency	Percentage
Asthma	314	71%
Rheumatoid disease	283	64%
Severe allergy	271	61.3%
Inflammation of joints	275	62.2%
Lupus	182	41.2%
Chronic obstructive pulmonary disease (COPD)	170	38.5%
Joint stiffness	141	31.9%
Ulcer	71	16.1%
Kidney stone	28	6.3%
Recurrent gastrointestinal ...	98	22.2%
Blood cancer (leukemia)	78	17.6%
Glomerulonephritis	106	24%
Adrenal insufficiency – Addison's disease	113	25.6%
Lymphomas	81	18.3%
Cardiovascular disease	27	6.1%
Diabetes Mellitus (DM)	19	4.3%
Hypertension	20	4.5%
Mental illness (Anxiety & Depression)	18	4.1%
Dyslipidemia	23	5.2%
Cushing's syndrome	29	6.6%
Gastroesophageal Reflux disease (GERD)	23	5.2%
Erectile dysfunction	15	3.4%

Table 3. Community's awareness of side effects of corticosteroids

tory ailments.

Most respondents in the survey associated corticosteroids with rheumatoid disease (64%) and joint inflammation (62.2%). This shows that there is a large awareness of the use of corticosteroids for inflammatory and autoimmune diseases.

The corticosteroids are accepted by the community to be a good drug for allergies.

Moderate awareness

The awareness of lupus, a systemic autoimmune disease usually treated with corticosteroids, was noted among 182 respondents (41.2%). There is considerable awareness of the use of corticosteroids for Chronic Obstructive Pulmonary Disease (COPD). However, this awareness is lesser than that for asthma. They may help reduce arthritis stiffness. About 32% of the people know the benefits of they don't have high knowledge.

Low awareness conditions

Many have misinformation; difficulty breathing or tendency for rupture nuts are common. 24% of respondents have either fibromyalgia, and more than 25% have adrenal insufficiency. A lot of people don't know that corticosteroids are used to treat GI issues with 98 folks reporting this. Leukemia and Lymphomas are blood cancers and they are 17.6% and 18.3%. Used as cancer treatment the corticosteroid dexamethasone is commonly used to treat cancer.

Very low awareness conditions

Many people do not know about these illnesses due to the use of corticosteroid drugs. Their knowledge of the same is limited. When people hear about the side effects of drugs like corticosteroids, diabetes mellitus and hypertension may not come to mind. People don't understand how a person goes mad or how the medication interferes with the mind. The community does not recognize erectile dysfunction and dyslipidemia

Variable	Frequency	Percentage
Have you ever taken corticosteroid treatment?		
Yes	176	39.8%
No	266	60.2%
During your diagnosis/treatment, did you receive verbal or written information from your doctor regarding the side effects of corticosteroid treatment? (n = 202)		
Yes		
No	72	40.9%
I don't remember	71	40.3%
	33	18.3%
Did you experience any of these side effects while taking corticosteroids? (You can choose more than one option) (n = 202):		
Weight gain		
Mood changes	82	46.6%
Skin changes (e.g., bruising, thinning skin, stretch marks)	46	26.1%
Acne/pimples on the face		
Palpitations	23	13.1%
Insomnia	17	9.7%
Face roundness (moon face)	23	13.1%
Indigestion	28	15.9%
Hypertension	20	11.4%
Osteoporosis	6	3.4%
Eye diseases (e.g., white water, glaucoma)	11	6.3%
High blood glucose level	14	8%
Infection (ex: pneumonia)	9	5.1%
Cardiovascular diseases (ex: heart attack)	18	10.2%
None of the above	5	2.8%
	3	1.7%
	54	30.7%

Table 4. Corticosteroid users' awareness of side effects, and evaluating the doctor's level of awareness.

Variable	Frequency	Percentage
Friends and family	150	33.9%
Healthcare providers	210	47.5%
Social media	123	27.8%
Medical websites	259	58.6%
Public websites	69	15.6%
Magazines and books	89	20.1%

Table 5. Participants' sources of information regarding corticosteroid treatment.

as side effects.

Rarely recognized conditions

Kidney stones (6.3%), GERD (5.2%), and anemia (7%) are conditions that may associate with corticosteroids that are lesser known.

Epidemiological implications

The data shows awareness in the community about these conditions related to corticosteroids is fairly variable. Most of the respondents were well aware of respiratory and autoimmune diseases indicating a common use of the drug. Unawareness of metabolic, cardiovascular, and oncological conditions suggests severe voids. There should be more campaigns and announcements in public for awareness about risks and side effects relates to corticosteroids which are with the diseases of severe risk.

Corticosteroid users' awareness of side effects, and evaluating the doctor's level of awareness.

Table 4 shows the extent to which users of corticosteroids are aware of the side effects and how much was communicated by health care personnel. Key insights include:

Corticosteroid usage

About 40% of participants reported the use of corticosteroids. In other words, 71 people were unaffected

by this news piece. Of all the participants, 33 respondents were unsure if they obtained this information. The most common side-effect reported (n=202; multiple response allowed) weight gain experienced by 82 respondents (46.6%). Most of the participants were aware of the changes in mood as reported by 46 participants (26.1%). A total of 23 participants (13.1%) had various skin problems. Acne on the face was reported by about 10% of participants. A few people had heart palpitations (13.1% of participants). 28 respondents (15.9%) said they have insomnia. Twenty people reported that their faces became rounder or fuller. A total of 6 (3%) reported having stomach issues. 11 (6.3%) indicated they have hypertension. 14 people said they had osteoporosis. Nine respondents (5.1%) reported eye problems such as glaucoma and cataracts. 18 people had high blood sugar level 5 people were so ill with serious infections like pneumonia. Three patients indicated problems related to a heart attack. 54 patients (30.7%) were having none of the above mentioned effects.

Participants' Sources of Information Regarding Corticosteroid Treatment

Table 5 presents participants' sources of information regarding corticosteroid treatment. The most commonly reported sources of information regarding corticosteroid treatment were friends and family, healthcare providers, and social media, accounting for 45.5%, 38.8%, and 28.8%, respectively.

5. DISCUSSION

Findings of this study show the community lacks knowledge, awareness, and communication. This refers to the use of corticosteroids and their side ef-

fects. The discussion incorporates relevant literature to interpret the findings.

The data in Table 1 shows that the routes of corticosteroid administration are quite well-known. This knowledge may come from using some of these routes for a long time. The low enrollment for rectal (15.6%) and topical injection (31.9%) routes implies that not much information is provided to patients regarding these routes. The patient education to enhance the outcomes of therapy as well as adherence to treatment protocols (34) has been prioritized.

Corticosteroid treatment side effects

The patients complained of more of weight gain (81%) and change in mood (45.9%) which are well-recognized side effects of steroids (35, 36), as depicted in Table 2. Fluid retention, brittle bones, and high blood sugar are serious metabolic effects; these match earlier study (37). Even so, some rare side effects like anemia (7%) and epilepsy (4.3%) do not seem to be well-known. It is important to teach patients common, as well as rare side effects, so they can monitor and report early (38).

Individuals knowledgeable about health issues related to corticosteroids as shown in Table 3 shows that the community possesses good knowledge about the use of corticosteroids for asthma (71%), rheumatism disease (64%) and swelling-of-joints (62.2%). The public has more knowledge about corticosteroids to treat respiratory and autoimmune diseases than other conditions (39).

Awareness and Doctor-Patient Communication

The communication from healthcare providers on side effects was received by only 40.9% of corticosteroid users (Table 4). When healthcare professionals do not communicate properly, patients are made responsible for medical mistakes and misuse of medicines. This causes gaps in treatment adherences and gaps in safety (40). Also, the high percentages of respondents reporting weight gain and mood changes imply they should be routinely counselled about side effects initiation of therapy.

Sources of Information on Corticosteroids

As indicated in Table 5, friends and family at 45.5% is the most common source of information, followed by healthcare professionals at 38.8%. Most people obtained their information from friends/family as seen previously with chronic-use medications (41), and healthcare professionals (38.8%). We must encourage healthcare professionals to give out credible information based on evidence.

Epidemiological Implications

The findings serve as the foundation for a thorough strategy that aims to educate members of the community about the appropriate uses of corticosteroids and their adverse effects. Some corticosteroids have appreciable risks that many health professionals are not aware of. People know less about the risk of heart and cancer diseases. So, people must understand the complications of these. Besides, they should effectively

communicate during the consultations to reduce misinformation and improve safety.

6. CONCLUSION

The current study highlights insufficient knowledge, awareness, and communication regarding the use of steroids and their adverse effects. People clearly know about the use of corticosteroid for treating disease are respiratory like asthma and auto immune disease like rheumatoid disease. But the knowledge regarding use in metabolic, cardiac and oncological diseases is lacking. Just like how weight gain and mood changes are very common. Drug-induced anemia and heart problems are not very well known due to lack of awareness. Doctors often miss out on informing patients about possible side effects. Less than half the people said they got to know about side effects of corticosteroid from their doctor's opinion. Not talking about it can only lead to wrong information and unreported affects causing harm to the efficacy of it. In other words, the study findings highlight the need of community counseling and counseling by the health care provider on use of steroid. To improve the outcome of the treatment of patients in the best way possible we need not only to make them aware of the risks related to corticosteroids but also manage them properly. We will achieve better patient outcomes, improved therapy adherence, and better population with proper system which reduces the gaps.

- **Authors contribution:** M.T.A. and M.B. gave substantial contributions to the conception or design of the work in acquisition, analysis, or interpretation of data for the work. M.T.A., Z.B.J., H.C., and K.S.I. had a part in article preparing for drafting or revising it critically for important intellectual content. M.B., and M.M. gave final approval of the version to be published and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.
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