



## Boswellia: A Systematic Review of the Adverse Events

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### Abstract

Boswellia is one of the oldest alternative medicinal plants in the world. Boswellia is thought to have anti-inflammatory effects, antioxidant properties, and immunity stimulating. This herbal medicine relieves several diseases such as osteoarthritis, asthma, and inflammatory bowel diseases. Little is known about the adverse drug reactions of Boswellia; this systematic review attempted to identify the potential side effects of this supplement and its severity in different diseases. Relevant studies conducted up to May 2024 were identified from Scopus, Science Direct, Web of Science, PubMed, Cochrane Library, and Embase databases. Spontaneous reports about the side effects of Boswellia were gathered from three international spontaneous reporting schemes, as well. Age, sex, type of disease, dosage, and duration of the drug as well as self-reported side effects were considered. Subgroup analysis was performed to determine the prevalence of each adverse effect of Boswellia. The quality of the included trials was assessed using version 2 of the Cochrane risk-of-bias tool (RoB 2). Sixty-two clinical trials were included in this review. Twenty-five of them reported side effects. Twenty-seven studies reported that Boswellia had no adverse effects, and 10 articles had not mentioned the side effects. Low-to-high risk of bias was found in clinical trials. Ten case reports were included in this study, but no case series was included. Spontaneous reporting schemes included 26 reports. The most common adverse effects were gastrointestinal disorders and cutaneous allergic reactions. Although most detected adverse effects were mild to moderate, two patients developed hypersensitivity pneumonitis and bezoar formation, respectively. This systematic study reported that Boswellia, as an herbal medicine, is often considered safe to use; however, it is possible to experience severe side effects. We suggest that Boswellia should be administered only under the supervision of a specialist doctor in usual medical treatment.

**Keywords:** Adverse effect; Boswellia; Clinical trial; Frankincense; Systematic review

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case reports, and spontaneous reporting schemes. In 40.3% of clinical trial studies, Boswellia consumption was associated with adverse effects. The most reported adverse effects from oral consumption of Boswellia were related to gastrointestinal problems including diarrhea, nausea and vomiting, abdominal pain, and acidity, and from topical use including itching, burning sensation, and redness. 43.5% of the eligible clinical studies in this systematic review reported that Boswellia was well tolerated by study participants and was not associated with adverse events. Among 62 clinical trials, 10 studies had not mentioned any data about the side effects of Boswellia [71-80]. Hamid Zare et al. (2022) in a systematic review of pomegranate mentioned that 16.6 % of included clinical trials reported side effects including gastrointestinal problems, flu-like symptoms, and urinary problems. Furthermore, in about a third of studies it was introduced as a safe fruit and 51.5 % of studies have not mentioned any adverse effects [94]. In Hajimonfarednejad et al. (2018) survey about the side effects of cinnamon 50% of included in clinical trials have not declared complications as well [13].

Not reporting side effects may be because evaluation of the efficacy of a plant in the treatment of diseases was more important than detection of its side effects. In addition, it may be related to ignoring appropriate monitoring tools, hiding some of the data, or not paying attention to the importance of side effects of herbal remedies [94]. Researchers should become familiar with herbal toxicities and have planned to identify them before starting their research [95]. For accuracy in reporting side effects, the researcher can design a questionnaire for adverse events and in the follow-up of the patients, in addition to evaluating response to treatment, ask questions about complications. The most prevalent complications in the trials of our study were gastrointestinal disorders that were not life-threatening. In studies with Boswellia consumption, some complications mentioned in adverse effects may occur due to underlying diseases [25,28,34]. Thus, determining the causality of adverse events in the studies is important [95]. Investigations on healthy volunteers while considering ethical principles help to distinguish the complications directly related to Boswellia.

Traditionally, *B. serrata* and *B. carteri* have been used for the treatment of many diseases [11]. Our study determined that the most prevalent species of Boswellia in clinical trials was *B. serrata*.

Most case reports published about Boswellia were about its efficacy [88,96,97]; also, Boswellia was used in multi-herbal medications [98-100]. We found 10 cases with side effects associated with the use of

Boswellia mono-herbal preparation. Cutaneous complications were the most frequent type of side effects between them [82,83,89-91].

Case reports are important because they warn about unexpected complications that may be life-threatening [101, 102]. We should pay attention to these side effects because some complications do not improve without surgical or medical interventions [84,85]. Some adverse events occur because of herbal abuse or the fact that patients have no information about the side effects of the herbs or drug-herb interactions [103]. Therefore, the incidence of side effects in case reports provides the practitioner with some insights to give more information to patients.

WHO Collaborating Center for International Drug Monitoring Database did not mention a detailed formulation of the medication. Today, an acceptable safety profile of herbal products is necessary [104, 105], and to achieve this goal, it is suggested that in studies, in addition to effectiveness, researchers should consider their side effects. It is also necessary to have evidence-based data-gathering research for assessing adverse events [106]. Also, due to the increasing use of medicinal plants in all countries of the world, including developing countries, it is necessary to further apply the spontaneous reporting systems in these countries as well [107].

## Conclusions

The available data suggested that Boswellia was well tolerated in most people and had no life-threatening complication, but it might have side effects that may require treatment to be resolved, especially gastrointestinal disturbance and allergic reactions; therefore, its consumption should be monitored, probable side effects should be described for patients, and it should not be considered completely safe.

## Ethical Considerations

The study was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.sums.med.rec.1399.130)

## Conflict of Interests

All the authors have no conflict of interest to declare.

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