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# Nanotechnology Enhanced Oral Bioavailability in Saudi Arabia: A Meta-Analysis

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## Abstract

**In terms of drug delivery methods, oral administration stands out as the best option because it guarantees excellent patient compliance. But the inability of medications to dissolve in water and their insufficient metabolic/enzymatic stability are the main barriers to effective oral drug administration. Nanotechnology based drug delivery systems offer the potential to overcome the issues with oral medication delivery, among other approaches. Nanotechnology based drug delivery systems provide an alternative to administer antihypertensive drugs with improved therapeutic impact and bioavailability. In this study, data on the improvement of oral bioavailability (Area Under the plasma Concentration time curve, AUC) by nanotechnology were combined from various investigations using meta-analysis of the 37 papers total in this study, 21 studies from the country of Saudi Arabia were included in a particular meta-analysis. According to the investigation, the formulations based on nanotechnology had an overall improvement power of 7.94% for medication bioavailability.**

***Keywords:** Nanotechnology; Medication; Plasma concentration; Bioavailability; Administration*

## Introduction

It is now widely accepted that materials with sizes in the nanoscale range differ from those with larger sizes in terms of chemistry, biology and physics. For the potential application of nanotechnology in the realm of media, this unique quality of nanoparticulate materials has been extensively researched. One of the most interesting and promising uses of nanotechnology is in medication delivery; nanotechnology mechanisms have the potential to increase the potency and effectiveness of medicines administered using a variety of delivery methods. Nanoscale molecules or particles used in drug delivery using nanotechnologies have the potential to increase a medicine's bioavailability. Devices like nano-robots, which are nano-engineered to optimize bioavailability at specific locations in the body as well as over a period of time, are used for molecular targeting. Oral dose forms promote improved patient compliance, are simple to deliver and are less expensive than other dosage kinds, making them the most popular and commonly used method of medication administration. More than 70% of all medications are administered orally and they can be in either liquid (such as suspensions and solutions) or solid form. However, it has been highlighted that "drugs taken orally as opposed to parenterally are not directly available in the systemic circulation to exert their therapeutic impact." They must first pass through the GI tract and be absorbed before they may enter the bloodstream. As a result, the oral route for drug administration offers, at best, a delayed commencement of action in comparison to the parenteral route or at worst, it may altogether exclude some medications that cannot reach the blood.

## Description

The medication's physical, biological and chemical interactions with the physiological components of the GI tract influence whether or not the drug may enter the bloodstream intact and exert its full effect, as well as to what extent. Le asserts that oral medications must travel *via* the intestinal wall and the portal circulation, both of which are common sites of first pass metabolism, before reaching the liver metabolism that occurs before a drug reaches systemic circulation. As a result, many medications might be digested before they reach the proper plasma concentrations. It is most typical for oral dose forms of slowly absorbed, weakly water soluble medicines to have low bioavailability. Low bioavailability is typically caused by insufficient GI absorption time. If the medicine does not dissolve well or cannot pass through the epithelial layer, time may not

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be enough at the absorption site if it is highly polar and ionized, for instance. In such cases, bioavailability may be limited and highly variable. Drug bioavailability can also be impacted by previous gastrointestinal surgery like bariatric surgery, physical activity, age, genetic phenotype, sex, diseases such mal absorption syndromes and alchlorhydria and stress. Chemical processes that reduce absorption can also lower bioavailability. Some examples of these reactions are the hydrolysis of drugs by digestive enzymes or gastric acid such as penicillin and chloramphenicol palmitate hydrolysis, the formation of a complex such as polyvalent metal ions and tetracycline, the absorption of other drugs (such as cholestynamine and digoxin), the metabolism of drugs by microflora in the lumen and conjugation of drugs in the intestine's wall (example, sulfuconjugation of isoproterenol). In terms of drug delivery methods, oral administration stands out as the best option because it guarantees excellent patient compliance. But the inability of medications to dissolve in water and their insufficient metabolic/enzymatic stability are the main barriers to effective oral drug administration. There are numerous approaches to solving issues with hydrophobic medicines. Nanotechnology based drug delivery systems offer the potential to overcome the issues with oral medication delivery, among other approaches. Nanotechnology based drug delivery systems provide an alternative to administer antihypertensive drugs with improved therapeutic impact and bioavailability. It is necessary to conduct a thorough investigation and analysis of related studies compiled on nanotechnology enhancement of oral bioavailability in order to monitor the current progress of research on oral bioavailability and nanotechnology and determine the application/capabilities of nano-technological approaches in enhancing the bioavailability of orally administered drugs. Additionally, the goal is to find common trends among the outcomes of linked studies, other interesting correlations and potential sources of disagreement that might emerge over the course of numerous studies. This review's related pharmacokinetic parameters were quantitatively analyzed using meta-analysis, a statistical technique that is appropriate for this course of "combining the findings from independent studies most often used to assess the clinical effectiveness of healthcare interventions". These parameters were compiled from numerous studies on enhanced oral bioavailability through nanotechnology

## Conclusion

In the present study, a total of 37obtainable proof of concept studies were identified, included using certain eligibility criteria and analyzed for the oral bioavailability enhancement. 21 of the included studies where of vital importance as this study focused more on literatures and outcome from Saudi Arabia. In view of this the 21 studies obtained were analyzed oral bioavailability enhancement through nanotechnology in Saudi Arabia. The result of this study can provide a better guide for drug formulators on enhancing the effectiveness of orally administered drugs especially the antineoplastic drugs.