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"APPLICATIONS, OCCUPATIONAL RISKS, AND PREVENTION MEASURES OF NANOPARTICLES IN HEALTHCARE SECTORS"

*Aschalew Nega Teferi

Department of Chemistry, College of Natural and Computational Sciences, Debark University, Ethiopia.

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*Corresponding author:
Aschalew Nega Teferi
Department of Chemistry, College of Natural and Computational Sciences, Debark University P. O. Box. 90, Debark, Ethiopia.
Email: aschalewnega968@gmail.com

ABSTRACT

Background: This review of relevant in A nanoparticle is the most fundamental component in the fabrication of a nanostructure, Healthcare Sectors is based on the fundamental knowledge accumulated Applications, Occupational Risks, and Prevention Measures of Nanoparticles were identified. In this review, the most Nanoparticle chosen based on the application, risk on healthcare sectors. **Conclusions:** This review has shown that Applications. Occupational Risks, and Prevention Measures of Nanoparticles in Healthcare Sectors are not studied or peoples who do not have understand their application, Occupational Risks, and Prevention. Medicines are especially promising, and areas such as disease diagnosis, drug targeting at specific sites in the body, and molecular imaging are being intensively investigated and some products are undergoing clinical trials. Different approaches like charged, gold and magnetic resonance nanoparticles show promise for drug delivery applications. Nanoparticulate drug delivery systems are extensively used to treat diseases of cardiovascular, lung, brain, cancer, etc. however, significant levels of nanoparticle pollution have arisen in most major cities and even across large regions of our planet, with climatic and environmental effects that are generally unknown. The full information about the chemical and physical properties of nanomaterials is still not addressed or completed. This review paper is focused on the use of nanoparticles in health sectors, and the risks of nanomaterials in workers and employers in workplace. It also provides information about steps that can be taken to Prevention Measures exposures.

KEYWORDS: *Nanoparticles,* hazards, *Healthcare,* physical properties.

BACKGROUND

Nanotechnology is the science that deals with matter at the scale of 1 billionth of a meter (i.e., 10 − 9 m = 1 nm), and is also the study of manipulating matter at the atomic and molecular scale. As a result, nanotechnology produces a wide range of new structures and systems known as nanoparticles, nanodispersions, nanolaminates, nano tubes, nanowires, buckyballs, quantum dots, and other terms.[1,2, and 15] A nanoparticle is the most fundamental component in the fabrication of a nanostructure, and is far smaller than the world of everyday objects that are described by Newton ' s laws of motion, but bigger than an atom or a simple molecule that are governed by quantum mechanics. The nanoparticles differ from various dimensions, to shapes and sizes apart from their material.[3-5] A nanoparticle can be either a zero dimensional where the length, breadth and height is fixed at a single point for example nano dots, one dimensional where it can possess only one parameter for example graphene, two dimensional where it has length and breadth for example carbon nanotubes or three dimensional where it has all the parameters such as length, breadth and height for example gold nanoparticles. The nanoparticles are of different shape, size and structure. It be spherical, cylindrical, tubular, conical, hollow core, spiral, flat, etc. or irregular and differ from 1 nm to 100 nm in size. The surface can be a uniform or irregular with surface variations. Some nanoparticles are crystalline or amorphous with single or multi crystal solids either loose or agglomerated.[3,6, and 7] The unique properties and utility of nanoparticles arise from a variety of attributes, including the similar size of nanoparticles and biomolecules such as proteins and polynucleic acids. Additionally, nanoparticles can be fashioned with a wide range of metal and semiconductor core materials that impart useful properties such as fluorescence and magnetic behavior.[8,9] Nanoparticles (NPs) and nanostructured materials (NSMs) are an active area of research and a techno-economic sector that is expanding rapidly in many application domains. Because of their tunable physicochemical properties such as melting point, wettability, electrical and thermal conductivity, catalytic activity, light absorption and scattering, NPs and NSMs have gained prominence in technological advancements, resulting in superior performance over their bulk counterparts.[10,11] Nanoparticles are being used for diverse purposes, from medical treatments, using in various branches of industry production such as solar and oxide fuel batteries for energy storage, to wide incorporation into diverse materials of everyday use such as cosmetics or clothes.[12-14]

Characteristics of nanomaterials are generally combined into the high surface also in bulk materials. Physicochemical and biological properties can be developing with the matter in the nanoscale. Nanoparticle levels such as bioavailability improvement, drug distribution that may be varied from body parts like brain, liver, lungs, and other body parts in delivering system in which can be increasing the efficiency and safer of drugs.[16-17] The challenge of modern medicine that the entire drug dose not absorbed by the patient body and therefore, drugs can be ensured to the specific area in the body with greater accuracy and precision as well as it can be formulated with the active components better permeates cell membranes, reducing the required dose by the scientists using nanotechnology. However, there is little knowledge about the risk of nanomaterial by the worker and employers in the workplace, especially in the developing country. The services of healthcare can be varying in locations that include clinics, hospitals, and mobile emergency centers and homes.

Properties of a Nanomaterial at the Nanoscale

Particles that have a diameter smaller than about one hundred nanometers (100 nm) can be considered nanoparticles.[16] A nanoparticle is a nano-object. This nano-object has all three external dimensions in the nanoscale. In other words, a nanoparticle is a discrete nano-object. All three Cartesian dimensions of this nano-object are.[24,25] It includes nanofibres and nanotubes, composite materials, and nanostructured surfaces. As shown in **Fig. 1**, in most cases, nanoparticles show that different physical and chemical, as well as biological features, also thus acts differently with the materials of the same rough structure of the molecular composition of matter. Nanomaterials have a high fixed surface or interface area and they are more reactive than the same thicker arrangements with the same mass as many reactions of biological and chemical reactions that take place at the material surfaces. Because nanomaterials are much small in size, they easily move through the biological systems in the body and have a high ability to across or penetrate the cell membrane in the cell tissues that were taken by the cell-like lung, brain, and other cell tissue and therefore they cause unexpected and unusual exposure.[20,26]

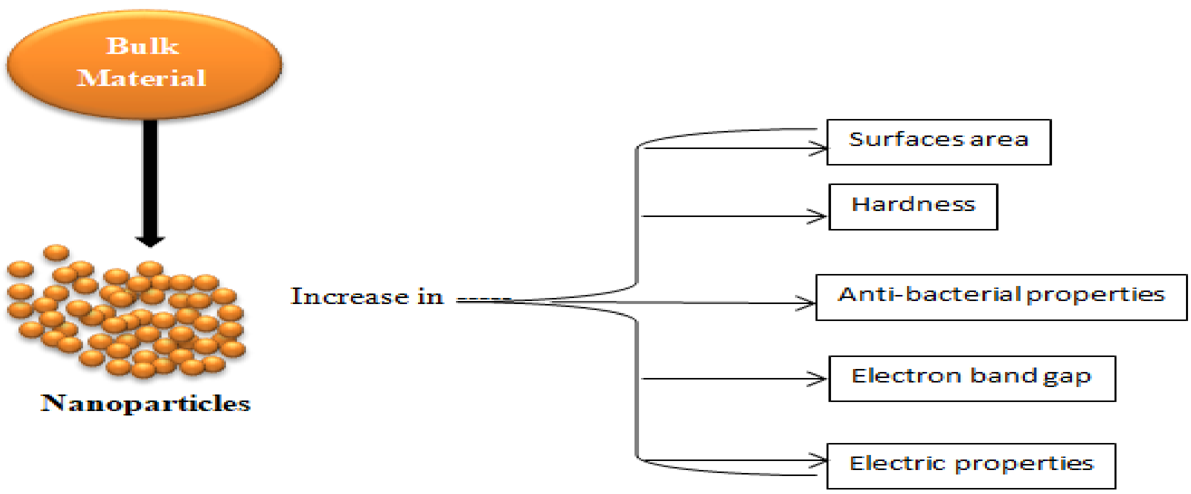

Fig. 1: Bulk materials cannot be implemented in most fluid products unless made very small.[21,27]

For the surface of nanoparticles, metal ions, minor molecules, and polymers most important to functionalized. As shown in **Table 1,** a broad range of material properties can be selectively adjusted by structuring at the nanoscale.

Table 1: Some changeable properties of nanomaterial.[36-39]

Properties	Examples
Catalytic	Due to the higher ratio of surface-to-volume, catalytic efficiency is high
Electrical	Increase in metallic resistance Increase in ceramic and magnetic nanocomposite electrical conductivity
Magnetic	Magnetic coactivity and superparamagnetic behavior increase
Mechanical	The hardness and toughness of metals and alloys increased The ductility and superplasticity of ceramics improved
Optical	The spectral properties of optical absorption and fluorescence are shifted Quantum efficiency of semiconductor crystals increase
Biological	The biocompatibility is improved Permeability is increased in membranes, blood-brain barrier

Catalytic properties

Every nanoparticle will have a precise extraordinary surface area to volume ratio. This means for catalyzing the reaction of the percentage of atoms that available on the surface of the particles with the inverse of the radius of the particles.[37]

Optical properties

The valuable properties of nanoparticles are optical properties in which its application includes the optical detector, solar cell, photo-electrochemistry, photo-catalysis, imaging, laser, biomedicine, and sensor.[38] Diameters of particles that less than 10 nm are quantum dots which are a nanoparticle subset. The small sizes of the particle that affect the intrinsic bandgap of the semiconductor are semiconductor nanoparticles which are quantum dots. The bonding and antibonding configuration of the crystal lattice causes valence and conduction band in the semiconductor.[33,39] As shown in **Fig. 2**, the parameters like shape, size, doping, and surfaces of the nanomaterial affect the photosensitive characteristics.[39]

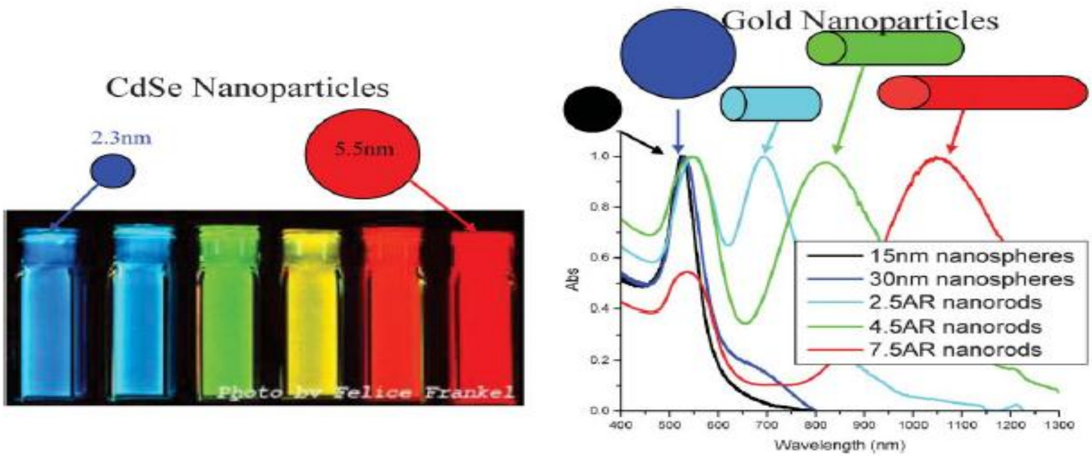

Fig. 2: Fluorescence emission of (CdSe) ZnS quantum dots of various sizes and absorption bands of numerous sizes and shapes of gold nanoparticles.[31-34]

Electrical properties

The most crucial aspects of nanoparticles are their electrical properties. Nanoparticles' exceptional symmetry and small size give them remarkable electrical, quantum, and lattice properties. They can carry a current which is 100 times greater than metals and semiconductors or insulators and this very important to make materials with high temperature.[40,41]

Mechanical properties

Nanoparticle characteristics mainly differ from the individual atoms, molecules, and wholesale materials. Various mechanical parameters may be surveyed to identify the mechanical nature of nanoparticles, for example, hardness, stress, elasticity, strain, abrasion, and linkage.[42,43] The most important characteristics of the nanoparticle are a mechanical property that studies the bulk metallic and ceramic materials, the influence of grain size, superplasticity, the influence of porosity, filled polymer composites, particle-filled polymers, and polymer-based nanocomposites filled with platelets, carbon nanotube-based mixtures.[22]

Magnetic properties

The most important characteristic of nanoparticles is their magnetic behavior which is of great interest for investigators from a diverse range of disciplines for instance catalysis of heterogeneous and homogeneous, attractive fluid, biomedicine, and data storing magnetic resonance image (MRI). When the size of nanoparticles is < critical value i.e. 10-20 nm, it is the best performance.[24,43] Nonmagnetic metals like bulk gold and platinum at nanosize can act as magnetic properties. The surfaces of atoms are different from the bulk materials and also can be modified by collaboration with chemical samples.[22]

Synthesis of Nanoparticles Methods

Several materials are used to synthesize nanoparticles, such as organic compounds like polysaccharides, protein molecules, and polymers. Nanoparticles can be manufactured in different ways, but out of many types, there are two most common methods. I.e. (1) Bottom-up approach and (2) Top-down approach.[28,40] These approaches further divide into various subclasses based on the operation, reaction condition and adopted protocols.

Top-down syntheses

In this method, destructive approach is employed. Starting from larger molecule, which decomposed into smaller units and then these units are converted into suitable NPs. Examples of this method are grinding/milling, CVD, physical vapor deposition (PVD) and other decomposition techniques.[23-25] This approach is used to synthesize coconut shell (CS) NPs. The milling method was employed for this purpose and the raw CS powders were finely milled for different interval of times, with the help of ceramic balls and a well-known planetary mill. They showed the effect of milling time on the overall size of the NPs through different characterization techniques. It was determined that with the time increases the NPs crystallite size decreases, as calculated by Scherer equation. They also realized that with each hour increment the brownish color faded away due to size decrease of the NPs. The SEM results were also in an agreement with the X-ray pattern, which also indicated the particle size decreases with time.[26] The top-down method further categorized in to dry method and wet method. There is an increase in the surface energy in the grain refining of particles that causes an increase in particle aggregation. The solid sample is ground by different methods such as shock, friction, and compression using a hammer mill, a roller mill, ball mill, and tumbling mill in the dry grinding method. However, the solid sample is ground by using a vibratory ball mill, a tumbling ball mill, a planetary ball mill, and a son. In the wet processing method, the condensation of nanoparticles is easily prevented than in dry methods as the result can obtain highly spread nanoparticles.[57]

Bottom-up syntheses

This approach is employed in reverse as NPs are formed from relatively simpler substances, therefore this approach is also called building up approach. Examples of this case are sedimentation and reduction techniques. It includes sol gel, green synthesis, spinning, and biochemical synthesis.[26] Limiting the concentration is one of the ways used for controlling the size of the nanoparticles as well as this methodology can be influenced by on the standard of super-saturation to control particle dimension.[57]

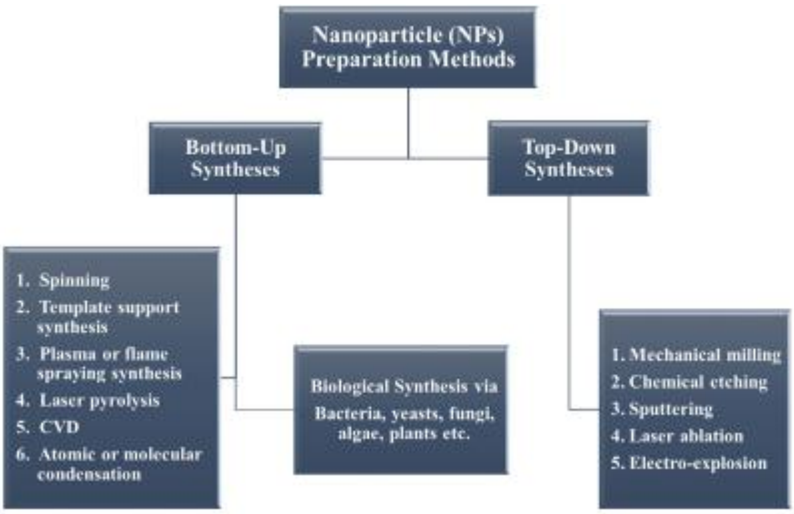

Fig.3:- Typical synthetic methods for NPs for the (a) top-down and (b) bottom-up approaches.

Table 2: physicochemical properties of Nanoparticles.[28]

Physical Method	Chemical Method	Biological Method
✓ Mechanical milling ✓ Laser ablation ✓ Sputtering ✓ Plasma arching • ✓ Chemical etching	✓ Sol-gel method ✓ Electrolytic deposition ✓ Chemical vapour deposition ✓ Microemulsion route ✓ Pyrolysis	✓ Micro-organisms (Bacteria, fungi, algae etc.) ✓ Enzymes ✓ Plant extract (Stem, root, flower, fruit, bark)

Applications and Risks of Nanoparticles in the Healthcare Sector

Nanotechnologies have basic inventions that contribute to human health and environmental safety in different ways, like cleaning drinking water, increasing efficiency of energy conversion, and energy storage. Nanoparticles can be used in variety of applications. Some important of these are given below.[20] Due to their very small size, nanoparticles have the potential to penetrate certain protective cell membranes in the body, so they can be used as carriers for targeted drug delivery. As a result, nanomaterials can easily circulate through the blood vessels and have a high ability to penetrate the cell membrane, have a high potential to detect diseases and prevent diseases in new ways.

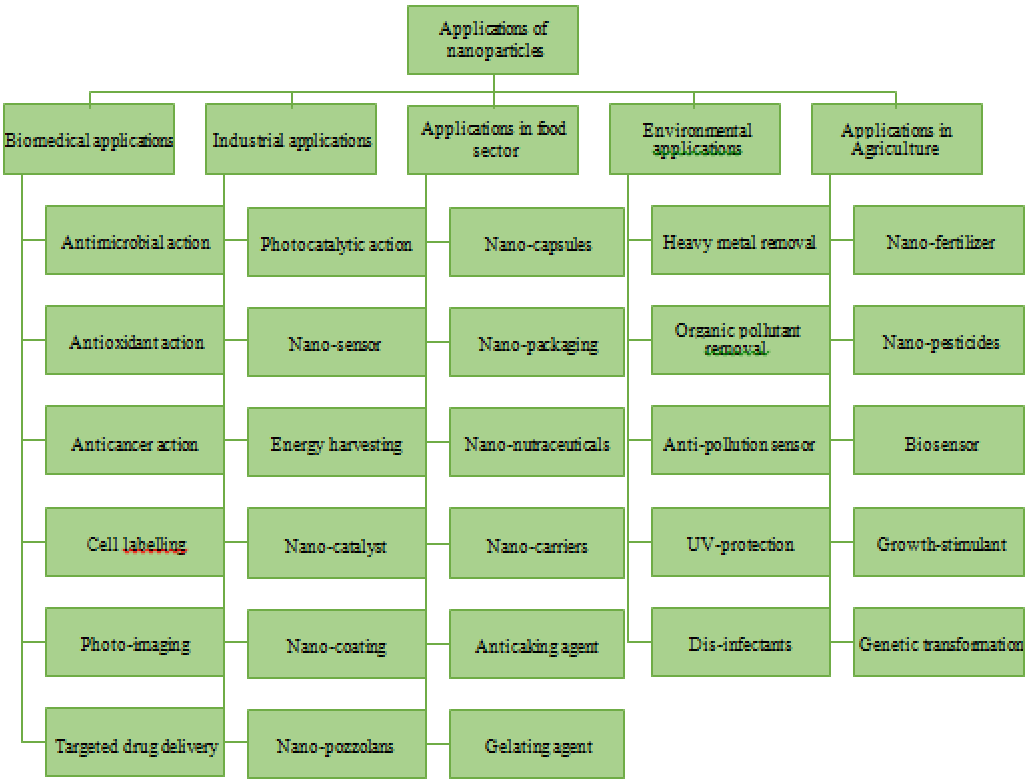

Figure 4:- Applications of Nanoparticles in various sectors.[17]

Table 3: Applications of some of the types of nanomaterials in the health sector.

Type of nanomaterial	Applications in healthcare
Metallic particles (e.g. iron (III) oxide, gold or silver))	➢ Hyperthermia cancer treatment ➢ Selective magnetic bioseparations ➢ Covered with antibodies to cell-specific antigens, for departure from the surrounding matrix ➢ Membrane transport studies ➢ Drug delivery ➢ Magnetic Resonance Imaging contrast agent.[22]
Silver nanoparticles	➢ Anti-microbial agent ➢ Incorporated into a wide range of medical devices, including bone cement, surgical instruments, surgical masks.[22]
Gold shell nanoparticles	➢ Improve solubility of drugs

	➢ Permit further conjugation.[22,38]
Carbon nanomaterials [fullerenes and carbon nanotubes (CNTs)]	➢ Buckyballs' (football-shaped structures made of 60 carbon atoms) are used in drug delivery systems to support the optimal transport and release of medicines to the right target inside the body.[22,29] ➢ Coatings for prosthetics and surgical implants ➢ Functionalized CNTs: • for therapeutic delivery • for biomedical applications such as vascular stents and neuron growth and neuron growth and regeneration • gene therapy, as a strand of DNA, can be bonded to a nanotube
Quantum dots	➢ Tag multiple biomolecules to monitor complex cellular changes and events associated with diseases ➢ Optics technology[22,35] ➢ Disease diagnosis and screening technologies
Dendrimers	➢ Polymerized macromolecules—highly branched structures with interior nanocavities or channels with properties different from those on the exterior ➢ Used as a transporter for a diversity of drugs (e.g. anti-cancer, anti-viral, anti-bacterial, etc.) with the capacity to improve solubility and bioavailability of poorly soluble drugs.[22,36]
Lipid-based nanoparticles	➢ Can fuse with the cell membrane and deliver molecules inside the cells
Ceramic nanoparticles	➢ Inorganic systems used as drug vehicles (if porous and biocompatible); used in cosmetic applications (zinc oxide, titanium dioxide)[22,43]
Nanotubes, nanowires, magnetic nanoparticles	➢ Disease diagnosis and screening technologies, including 'lab on a chip.[22,25]

Nanoparticles have a great ability to deliver drugs in the optimal amount range, resulting in increasing the therapeutic efficiency of the drugs and weakened side effects which have more interest in every branch of medicine.[12,25] Polymers and hydrophilic nanoparticles can be used to deliver the drug to the targeted part of the body and minimize the side effects.[12]

Risks of Nanomaterials in the Healthcare Sector

Workers may be exposed to nanoparticles during the manufacturing of these materials, transportation of these materials, formulation of these materials into products, and handling of these materials. The nano-scale materials have a high frequency of exposure to the worker due to higher concentrations and high surface area. Special attention is required in the workplace. The study concluded that occupational exposures of Nanomaterials are most likely to happen during handling and bagging of the materials and there is a high risk of dermal uptake.[49]

Parts of the human body, like the skin, lungs, and gastrointestinal region directly or indirectly interact with the environment. Nanoparticles may be discharged to the surroundings throughout fabrication, usage, additional treating, and removal. Due to their unique shape, small size, composition distribution, reactivity, and morphology of nanoparticles are estimated to affect their toxicity, creating their toxicity assessment complex as well as they may stay in the human environment and the body for a longer period compared to their larger corresponding item.[50] Not all nanoparticles produce adverse health effects and the effects or toxicity of nanoparticles depend on several factors, including morphology, size, shape, aggregation, crystallinity, etc. Some of the main effects of nanoparticles found in the lung include cell tissue damage, inflammation, chronic toxicity, oxidative stress, cytotoxicity, and tumor formation, among other things, while nanomaterials also affect the cardiovascular system.[51] As illustrated in **Fig. 5**, nanomaterials can enter the human body through several pathways, potentially posing a risk to occupational health:

- The most common method is inhalation, in which exposure to airborne nanomaterials at work can deposit in the lungs and respiratory tract. As the result of inhalation, they can cross to blood vessels and reach various body organs and tissues as well as reach the brain through the olfactory.[49,51]
- As shown in **Fig. 5,** nanoparticles can enter the body through the ingestion transfer from hand to mouth from the contaminated surface or by contaminated food or water ingestion as well as nanomaterials also ingested as the result of inhalation of nanoparticles.[49,51]
- Nanomaterials have a high potential to penetrate dermal organs. As a result, they can enter the body in this way and to less extent damage the skin surface.[31]

The nanoparticles present in waste discharged into/near water resources can lead to their entry into aquatic flora and fauna, leading to a severe toxicological effect on these aquatic species, including increased lysis of cell walls, lysosomal activity, protein denaturation, enzyme deactivation, disturbance of electron transport system, ribosomal disassembly, chromosomal aberrations, and apoptosis.[49]

The presence of an excess amount of metal oxide nanoparticles has been found to exhibit similar cytotoxic and genotoxic effects. Aluminium oxide nanoparticles can damage cellular DNA, whereas zinc oxide nanoparticles have also been found to affect cell viability by interaction with DNA and electron transport systems.[30] Titanium oxide nanoparticles have been found to impose toxic effects on the liver, kidney, immune system, etc.[31]

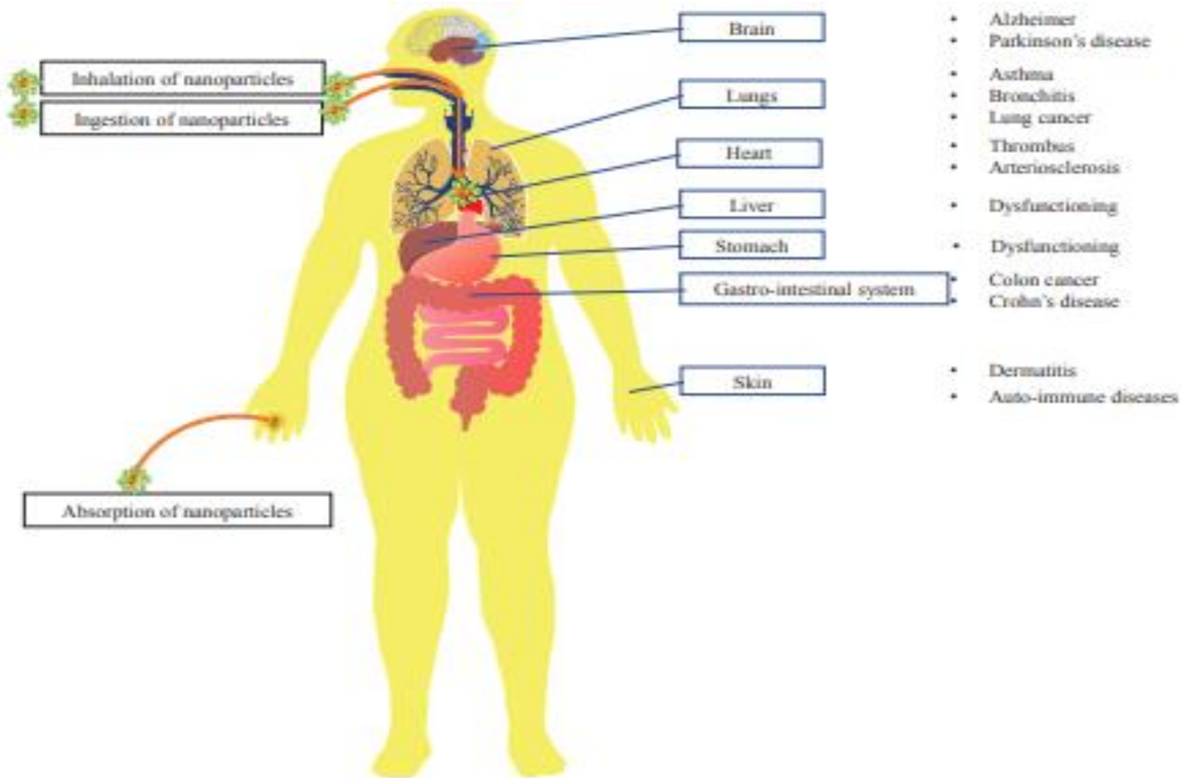

Fig. 5:-Toxic effects of nanoparticles on human body.[25,28]

In standard atmospheric environments, nanoparticles can form agglomerates or aggregates greater than 100 nm, so changing their nano-specific characteristics. However, nanoparticles can be released from softly assured groups, and definite environments, they can be discharged from further toughly assured aggregates. Just before determine whether this be situated promising, research should be conducted into lung fluid subsequently inhalation of agglomerates or else entire sum.[21,33] Nanomaterials found in the form of agglomerates of as entire sum should be agglomerates as well as entire sum containing nanomaterials should be taken into consideration in the workplace risk assessment. As shown in the **Fig. 6**, after inhalations or ingestion of nanoparticles, they simple distributed throughout the body by the blood circulation that cab causes to different illness and metabolism disorder.

Some environments that exposure to nanomaterials in healthcare can occur during[29]:

- Extra disposal of nano drugs from patients
- Spills of nanomaterials
- Handling of items containing nanomaterials
- Consumption of food and beverages that are contaminated with nano-drugs and
- Cleaning and maintenance of areas where nano-drugs are handled.

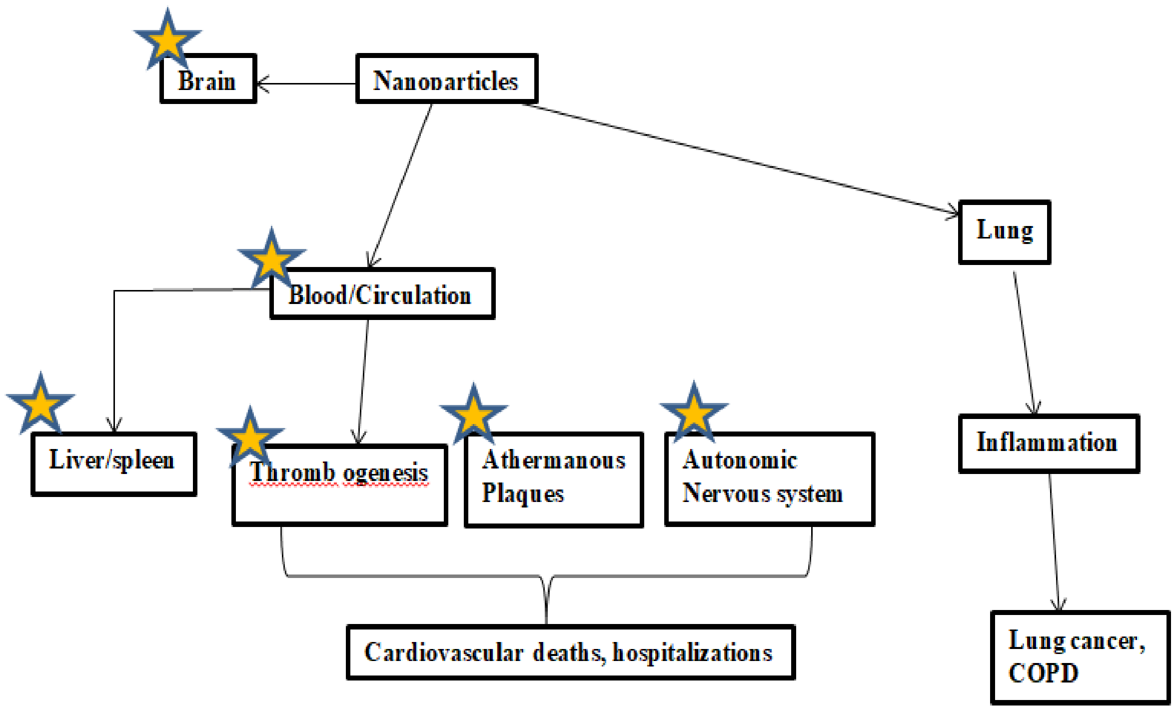

Fig. 6: Summary of potential human effects of nanoparticles [29]

Risk Assessment of Nanomaterials

Knowledge of the identity of the toxicity or risks of the products besides the exposure levels at the different workstations is considered by way of hazard valuation.[34] Exposure to nanomaterials is becoming one of the most significant risks in the workplace[35], especially for developing countries like African countries. The risks and occupational exposures of workers or employers to nanoparticles are caused by a severe lack of knowledge in these critical areas for assessing danger or risk, particularly in African countries.[42] In general, to control the risk and exposure of nanomaterials, there are three approaches, such as engineering techniques, administrative means, and individual protective equipment.[57]

Employers should measure worker contact to nanomaterials to find the control actions desired and conclude if the controls used are active in decreasing exposures by[56]:

- Detecting and describing processes and job tasks where workers may be exposed to nanomaterials;
- Identifying the physical state of the nanomaterials (dust, powder, spray, or droplets)
- Determining paths or methods of contact (breath, membrane interaction, or digestion) of particulates, slurries, suspensions, or solutions of nanomaterials;
- Determining what extra controls may be needed based on the exposure valuation results as well as evaluating the effectiveness of controls already in place.

PREVENTION MEASURES

Prevention and sound work practices are essential in occupational health and safety. Companies must guarantee that each worker receives acceptable and occasionally repeated health and welfare information and training. Therefore, the obligatory workshop risk assessment and the hierarchy of regulator actions like elimination, substitution, technical procedures at source, organizational actions, and individual caring apparatus (PPE) set in these employees' safety directives also apply to workplaces in the healthcare sector and nanomaterials.[48]

There are many types of limitations related to the nanoparticles at the workplaces that are carried out:-

1. Knowledge of the hazardous properties of nanomaterials;
2. To identify the source of emission and nanomaterials, the availability of methods and devices
3. The user chains down when the nanoparticles or products containing the nanomaterials are used or processed that nanomaterials present in the mixture or articles.

Generally, there are some methods that employers may use to reduce the potential of nanoparticles at the workstation.[38]

a. Personal Protective Equipment (PPE)

It is the last mark of protection in the hierarchy of contact regulators which provides employees with proper individual protective apparatus such as respirators.[29,39] gloves as well as protecting wear. The investigation is ongoing interested in the suitable choice of lab-coat material as it is related to nanoparticle penetration.

Respirators

Local ventilation systems cannot be sufficient in the activities that relate to airborne nanomaterials, for instance, milling of bridges or implants that contain nanomaterials, grinding, sanding. As a result, respiratory protection such as gas mask respiratory, dust masks, filtering face-piece respiratory, and powered air-purifying respirators[49] must be used.

Gloves

Most of the time gloves are used in the chemical hazards and in the health sectors which are effects from the synthetic polymer formed to protect from the nanomaterials.[50] For particular nanomaterials, the effectiveness of the glove depends on its form in the workplaces which is tested with the supplier of the glove. The actual flow rate of the nanomaterial in the glove depends on the width plus usage of two pairs of gloves recommended at the same times.[51]

Protective clothing

Best prevent the method of dermal contact to nanoparticles; there is no guide to the choice of other wear.

A. Engineering Controls

Because of the nature of their work, most healthcare workplaces are unable to implement methodological systems for reducing or protecting against exposure to nanomaterials, such as closed systems that erect a physical barrier between an employee and the nanoparticles.[42,54] This controlling method has used the application of nanotechnology that is similar to those that are currently used in controlling aerosols (gases, dust, chemical vapors, etc.) found in other laboratory applications and/or processes.[43,55]

B.Organisational measures

Risk prevention measures in workplaces in the healthcare sector in which hazardous nanomaterials are used include:

- specifically dedicated areas or workplaces for handling nanomaterials that are separated from other workplaces and clearly indicated with appropriate signs;
- minimizing the number of workers being exposed to nanomaterials;
- minimising the duration of workers' exposure to nanomaterials;
- prohibiting access of unauthorised personnel;
  - regular cleaning (wet wiping) of work areas where nanomaterials are used or handled; and
  - monitoring of air concentration levels, e.g. in comparison with background levels when no handling of nanomaterials occurs.[53]

C. Elimination and substitution

To shield employees from nanoparticle exposure, the proper elimination and substitution strategy must take precedence over other preventative measures, just like with all other hazardous materials. Workers should be removed or replaced with less toxic or dangerous ingredients if the nanoparticles are present. One way to lessen and prevent worker exposure to nanomaterials or risk is through organizational controls, which are policies and procedures.[44,52]

D. Administrative controls

Organizational controls, such as policies and procedures, are one of the most important ways to lessen and prevent worker exposure to nanomaterials or hazards.[45,55] The plan for nanoscale material hygiene, the preparation, training, and monitoring of standard operating procedures, the modification of work practices, the reduction of exposure time, and good housekeeping and workplace practices are the main components of these techniques. These provide hand washing stations as well as information encouraging the use of good hygiene practices. The proper protocol must be established in order to clean up any spills of nanomaterials, and surfaces would be decontaminated to reduce employee contact.[55-57]

CONCLUSIONS

An interdisciplinary field of technology that is rapidly growing and emerging is nanotechnology and nanoparticles. The science of nanotechnology examines materials on a nanoscale, which is entirely distinct from similar substances with larger compositions or dimensions. Nanoparticles have many applications in other fields, not only in healthcare centers but his review is focused only on the application and risks of nanoparticles in the healthcare sector. The physicochemical properties of nanomaterials and health effects must give more attention at the workplaces especially in developing countries. In developing countries like Africa, Human exposure to nanoparticles from natural and anthropogenic sources has occurred since ancient times. Following the invention of combustion engines and the development of industry, however, significant levels of nanoparticle pollution have arisen in most major cities and even across large regions of our planet, with climatic and environmental effects that are generally unknown. The full information about the chemical and physical properties of nanomaterials is still not addressed or completed. The suitable hazard assessment and prevention systems must be improved and continue in these countries. The major trend in further development of nanomaterials is to make them multifunctional and controllable by external signals or by local environment thus essentially turning them into nanodevic.

Abbreviations

NPS	Nanoparticles
PVD	Physical vapor deposition
CS	Synthesize coconut shell
SEM	Scanning electron microscope
CVD	Chemical vapor deposition
MRI	magnetic resonance image
NSMs	nanostructured materials
ZnS	Zinc sulfide
DNA	Deoxyribonucleic acid
CNTs	Carbon nanotubes

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Author contributions

Aschalew Nega Teferi Performed all the manuscript preparation, contributed to the conceptualization, designed and reviewed and approved the final version of the manuscript for publication.

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Availability of data and materials

All necessary data generated during the current study are available online in different forms such as books, various published journals and Google scholar.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Author details

Department of Chemistry, College of Natural and Computational Sciences, Debark University.

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