Assessment of Knowledge Regarding Nanotechnology and Its Role in Tuberculosis among Doctors

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Introduction:

Tuberculosis (TB) remains one of the most devastating infectious diseases & its eradication is still unattainable given the limitations of current technologies for diagnosis, treatment & prevention. The world health organization's goal to eliminate 'TB' globally by 2050 remains an on-going challenge because delayed diagnosis & misdiagnosis of TB continue to fuel the worldwide epidemic [1].

Despite the fact that we live in an era of advanced technology innovation, infectious diseases like tuberculosis (TB) continue to be one of the greatest health challenges worldwide [2]. The main drawbacks of conventional 'TB' treatment are the development of multiple drug resistance, resulting in high dose requirements and addition of second line drugs leading to subsequent intolerable toxicity [2]. Therefore there is a need of a new system. Nano system has considerable potential for diagnosis, treatment & prevention of this disease [2].

Aims & Objective:

- To create an awareness regarding Nanotechnology among doctors.
- To create an awareness regarding Nanotechnology in diagnosis, treatment & prevention of tuberculosis.

Materials & Methodology:

Type of Study: Cross sectional study.
Study Period: One Year.
Study Population: Doctors from Government Hospital.
Study Area: Karveer in Kolhapur District.

Study Tool: Questionnaire.

Predesigned questionnaire were given to each doctors & collected on the spot.

Statistical Method: Simple percentage.

Results:

In this study Post Graduate doctors were 37.84% & Undergraduate doctors were 62.16%. In this study ten questions were asked. These questions were grouped in four groups-

- Knowledge Regarding Nanotechnology.
- Knowledge Regarding use of Nanotechnology in diagnosis of Tuberculosis.
- Knowledge Regarding use of Nanotechnology in treatment of Tuberculosis.
- Knowledge Regarding use of Nanotechnology in prevention of Tuberculosis.

Group I:

In this group questions were included:

- Invention of word 'Nano' (Yes-29.72%) (Don't Know-70.28%).
- Invention of Nano Technology (Yes-10.81%) (Don't Know-89.19%).
- Use of Nano Technology in drug encapsulation & different diseases (Yes-48.64%) (Don't Know-51.36%).
- Gold & Nano particles linked to DNA, Peptides, Protein etc. (Yes-41.89%) (Don't Know-58.11%).

Table I

Questions	YES (%)	DON'T (%)
The word Nano is derived from Latin word which means 'Dwarf'.	22 (29.72 %)	52 (70.28 %)
Nanotechnology was first predicted by Nobel Laureate Richard Feynman in 1959.	8 (10.81 %)	66 (89.19 %)
Nanocrystalline materials are used in drug encapsulation, bone replacement, prosthesis etc.	36 (48.64 %)	38 (51.36 %)
Gold and Silver nano particles linked to DNA, Protein, Peptides and sugar.	31 (41.89 %)	43 (58.11 %)

- Overall Knowledge was (Yes-32.77%) (Don't Know-49.75%).

Group II:

In this group questions were regarding use Nanotechnology in diagnosis of Tuberculosis.

- Nano used in diagnosis of 'TB' (Yes-45.94%) (Don't Know-54.06%).

- CSIO of India designed 'TB Diagnostic Kit' which is currently in clinical trial (Yes-20.27%) (Don't Know-79.73%).

Table II

Questions	YES (%)	DON'T (%)
Nano particles are useful in diagnosis and treatment of tuberculosis.	34 (45.94 %)	40 (54.06 %)
Nano particles are useful in prevention of tuberculosis.	15 (20.27 %)	85 (79.73 %)

- Overall Knowledge regarding use of Nano in diagnosis of 'TB' was (Yes-33.11%) (Don't Know-66.89%).

Group III:

In this group questions were regarding use of nanotechnology in treatment of tuberculosis.

- Nano technology used in treatment of TB (Yes-52.71%) (Don't Know-47.29%).
- Nanotechnology is effective to reduce drug frequency & drug dosages of TB (Yes-55.41%) (Don't Know-44.59%).
- Nanotechnology is effective in drug resistant patient (Yes-62.17%) (Don't Know-37.83%).

Table III

Questions	YES (%)	DON'T (%)
Nano technology used in treatment of TB.	39 (52.71 %)	35 (47.29 %)
Nanotechnology is effective to reduce drug frequency & drug dosages of TB.	41 (55.41 %)	33 (44.59 %)
Nanotechnology is effective in drug resistant patient.	46 (62.17 %)	28 (37.83 %)

- Overall knowledge regarding use of Nano in treatment of 'TB' was (Yes-56.77%) (Don't Know-43.23%).

Group IV:

In this group questions were given regarding prevention of Tuberculosis.

- Nanotechnology is used in prevention of Tuberculosis (Yes-40.55%) (Don't Know-59.45%).
- Nanotechnology has invented needle free without refrigerator storage vaccine (Yes-28.38%) (Don't Know-71.62%).

Table IV

Questions	YES (%)	DON'T (%)
Nanotechnology is used in prevention of Tuberculosis.	30 (40.55%)	44 (59.45%)
Nanotechnology has invented needle free without refrigerator storage vaccine.	21 (28.38%)	53 (71.62%)

- Overall knowledge regarding prevention of Tuberculosis was (Yes-34.46%) (Don't Know-65.54%).

Overall Study:

Table of Four Group

Questions	YES (%)	DON'T (%)
Group I	24.25 (32.77%)	49.75 (67.23%)
Group II	24.50 (33.11%)	49.50 (66.89%)
Group III	42 (56.77%)	32 (43.23%)
Group IV	25.50 (34.46%)	48.50 (65.54%)

- Overall knowledge was - (Yes-32.27%) (Don't Know-67.73%).

Discussion:

According to Mathuria, Nanotechnology has provided a huge improvement of pharmacology through the designing of drug delivery systems which is able to Gorge phagocytic cells infected by intracellular pathogens such as micro bacteria [3]. The increase therapeutic index of anti-micro bacterial drugs; the reduction of dosing frequency, the improvement of solubility of hydrophobic agents & allowing the administration of higher doses, have been demonstrated in experimental infections [3]. He described the future of nano particles in reference to diagnosis, treatment & prevention of tuberculosis [3].

Nanotechnology in diagnosis of Tuberculosis

The diagnosis tools are required to meet the needs of the WHO's expansion of the Directly observed Treatment Short course, MDR & Co-infection with HIV [3]. In India, the country, with the highest estimated number of TB cases, research is underway into the role of nanotechnology [3]. The central scientific instrument organization (CSIO) of India designed a nanotechnology based 'TB' diagnostic kit, which is currently in a clinical trial based [3].

Nanotechnology in treatment of Tuberculosis

The important technological advantages of nano particles as drug carrier:
- High Stability (long shelf life).

- High Carrier Capacity (i.e. many drug molecules can be incorporated in the particle matrix).
- Feasibility of incorporation of both hydrophilic & hydrophobic substances [3].
- Feasibility of various routes administration including oral administration & inhalation [3].

Observation:

Knowledge regarding Nanotechnology and its use in diagnosis, treatment & prevention of tuberculosis is very less among doctors.

Conclusion:

In disease like tuberculosis nanotechnology has the potential to empower a local repose to challenges such as the diagnosis, treatment & prevention of this deadly disease.

References:

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