



REVIEW ARTICLE

USE OF GOLD IN HUMAN HEALTH AND DISEASES: RESEARCH UPDATES

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ABSTRACT

In ancient times, the gold was mentioned for increasing intellectual powers and longevity of life through the procedure of *swarnaprashan*. Gold in the form of fine gold dust, red colloidal solution, *swarnapatra*, *swarnabhasma*, *swarnaparpati*, *kharaliya* (trituated) formulations and *Sindoorkalpa*, (all are different types of forms of gold) often combined with *ghee*, honey, *medhya* (intellect promoting) and *rasayana* (rejuvenating drugs) herbs were popularly used in the *Ayurveda* therapies. In *Ayurveda* classics, gold is indicated for internal use even before conception for its *rasayana* (rejuvenator) and *vajikarana* (aphrodisiac) properties. After conception, it is used in *pumsavanakarma* (procedure done to get the desired sex of the baby and for the proper intra-uterine growth and development of the fetus). After birth, gold is indicated in *jatakarmasanskara* (birth ceremony) and in the form of *Lehana* (supplementary feeds) for the proper growth and development of the child. *Ayurveda* advocates that if *swarnaprashan* is administered for 1 month, the baby will become highly intelligent and will not be affected by any disease and if administered for 6 months, the baby will be able to remember the things, only by listening. Present review is an effort to critically evaluate the available evidences regarding the use of gold for the benefit of human being. The review proposes that the benefits of gold can be achieved at multiple levels like as a general health promoter and to enhance intelligence, immunity, digestion, metabolism, physical strength, complexion, or fertility.

Key words: *Swarnaprashan*, immunity, gold, *Ayurveda*

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INTRODUCTION

The *Ayurveda* system of medicine has appreciable antiquity, dating back to about 5000 years B.C. Materia Medica of *Ayurveda* contain resources in the form of drugs derived from plant, animal, metal and mineral sources^[1], the use of which have been described in various different pathological conditions.

During the medieval period, there was greater use of certain heavy metals and minerals in *Ayurveda* therapeutics. The references of gold are available in *Vedas* by the name of *Hiranya*. Gold preparation from mercury (*Rasa Vedhaja*) is also mentioned in *Kautilya Arthashastra*. In noted history, it becomes clear that in many countries including India throughout the globe, gold was used for commerce, ornaments and metallurgy with often its apparent benefit to health^[2-4].

In *Yajurveda*, Gold metal is said to be the ultimate beneficial. Gold enhances the longevity and strength, give prosperity, and cure diseases, increase luster, victory on enemies and diseases. By wearing gold as ornament, a person gets longevity among divine power and human being. By wearing *daksharayan* gold as a ornament or wearing *swarnamani* (Gold amulets), human being get relief from diseases, prevention from ill effects

of *rakshas*, *pisacha* (disease causing organisms).(*Yajurveda* 34/50-52)

According to *Atharvaveda*, wearing gold as a ornament provide longevity, age of 100 years and offers auspicious resolution, provides strength. Human beings are not suffered with evil spirit, micro-organisms and diseases by wearing gold ornaments and stunning. Ornamented *Daksharayan gold* provides life and longevity, *oja* (immunity), *bala* (strength), *virya* (potency), increase endurance and work as medicine. Ornamenting gold is beneficial for providing strength of conceiving women, get beauty, cure diseases, and destroy micro-organisms, provide prosperity and to gain better offspring's. (*Atharvaveda* 6/81/23)

During ancient period, the gold is mentioned for increasing intellectual powers and longevity of life through the procedure of *swarnaprashan*. Gold in the form of fine gold dust, red colloidal solution, *swarnapatra*, *swarnabhasma*, *swarnaparpati*, *kharaliya* (trituated) formulations and *sindoorkalpa*, often combined with *ghee*, honey, *medhya* (intellect promoting) and *rasayana* herbs (rejuvenator) were popularly used in the *Ayurveda* therapies.

In *Ayurveda* classics, gold is indicated for internal use even before conception for its *rasayana* (rejuvenator) and *vajikarana*^[5](aphrodisiac) properties. After conception, it is used in *pumsavanakarma*

^[6](procedure done to get the desired sex of the baby and for the proper intra-uterine growth and development of the fetus). After birth, gold is indicated in *jatakarmasamskara* ^[7] (birth ceremony) and in the form of *lehana* (supplementary feeds) for the proper growth and development of the child.

The ancient *Ayurveda* text '*Rasa-Jala-Nidhi*' documents that: "Gold is soothing, pure, nutritive, curer of poison, phthisis, insanity and other diseases. Gold improves vitality, fortune, beauty, intelligence and memory ^[8].

Ayurveda advocates that if *swarnaprashan* is administered for 1 month, the baby will become highly intelligent and will not be affected by any disease and if administered for 6 months, the baby will be able to remember the things, which are just heard ^[9]. It is the procedure where *swarna* (Gold) is mixed with *medhya* (intellect promoting), *balya* (strength promoting) and *rasayana* (rejuvenating) drugs. The selection of the drugs is aimed for both physical and mental well being of the child. This should be given for a stipulated time period with repeated administration.

MATERIAL AND METHODS

Ancient *Ayurveda* literature was thoroughly studied for this review like *Vedas*, *Samhita*, *Nighantu* and *Ras Shastra* Literature. The age and method of administration, benefits and

dosage as per various classics of *Ayurveda* are discussed here along with the reports of related scientific studies.

Uses of Gold in Ancient Literature

1. *Veda and Vedanga* ^[10]:

Gold is mentioned as *Hiranya* in *Vedas*, *Upanishadas* and *Smritis*. In *Rigveda*, It is mentioned in relation to sun for its antimicrobial properties. Golden ear ring is mentioned as *Hiranyakarnam Mangreevam*. This gives the knowledge of use of the metal gold as an ornament. In *Manusmriti* and *Yagvalakyasmriti*, *swarna* (gold) in the form of *swarna bhasma prashana* and its use along with *madhu sarpi* is mentioned.

2. *CharakSamhita* :

In *Charak Samhita*, external as well as internal use of gold is mentioned. Gold uses as equipments like tongue cleaner ^[11]. *Basti netra* ^[12] used to be made of metals like gold, silver, copper etc. It has been used as an ingredient which was usually meant for *rasayana* (rejuvenation) purposes ^[13-15]. Sheets of gold metal have been described for purpose of reducing body temperature in case of *pitta jwara* ^[16]. Its use in the form of powder in dose of 1 *shana* (2.915gm) has been used as anti poisonous formulation ^[17].

3. *SushutraSamhita* :

Properties of gold is *tridosahara*, *visapaham* (anti-poisonous), *bramhaniya* (nourishing drugs), *cakshushya* (eyetonic), *rasayana* (rejuvenative drug), *hridaya* (cardiotonic), *madhura rasa* and *sita virya*^[18]. Specific indication of *swarnapatra* (gold) as a content of *churnanjana* is also mentioned^[19]. For *nasya karma*, *swarna* along with *rajata*, *tamra* and *mani patras* are indicated for storage of *sneha* and *basti netras* are indicated to be made up of *swarna*^[20]. *Ghrita* and *madhu* is mixed in equal quantity and added with *swarna* and given for licking in the newborn babies to initiate feeding reflexes and immuno-protective phenomenon^[21]. Administration of *swarna* along with other herbs like *Shankhapushpi* (*Convolvulus pluricaulis*), *Kustha* (*Saussurea lappa*), *Vacha* (*Acorus calamus*), with honey and *ghrita* for a period of one year^[22]. Many formulations for oral administration have been mentioned mainly for new born child for enhance their intelligence, memory, and strength^[23-24].

4. **AshtangaSangraha:** (*Ashtanga Sangraha Uttar tantra* 49/29-34):

Combination of gold and herbals drugs as those who desire *ayu* (life longitivity) , *medha* (Intellect), *lakshmi* (wealth) and *kama* (sexual enjoyment) should consume it along with *Shankhapushpi* (*Convolvulus*

pluricaulis), *Vacha* (*Acorus calamus*), *Padma* (*Nelumbo nucifera*), *Kinjalka* (*Terminalia paniculata*) And *Vidari* (*Pueraria tuberosa*).

5. **Ashtanga Hridaya:**

Gold uses as cardio-protective after purification of body^[25], *punsavana karma*^[26], four formulation for *prashana*^[27], as anti poison^[28-29], are similar to *charaka* and *sushruta samhita*. *Curnanjana* and *anjana* for *santarpana* by rubbing gold with *ghrita* are specific for this period^[30].

6. **Rasa Literature:**

According to treatment point of view, gold is used for divine (*Daiva*) due to its quailities like quick action in small dose, tasteless properties, odourless properties^[31].

a) **Acharya Shiddha Nagarjun II**^[32]:

Tried to convert lower metals into higher metals. He knew the process of formation of gold. It is useful for economic purpose and also for internal uses.

b) **Rasendra Sara Samgraha**^[33] & **Ayurveda Prakasha**^[34]:

Impure gold is harmful when it is used internally because it may cause loss of *saukhya* (health), *virya* (potency), *balahani* (loss of strength) and produce various diseases.

c) **Rasratarangini**^[35] and **Rasa Ratna Samucchaya**^[36]:

Harmful effects of impure gold when it is used internally, is described mainly. *Bilva phala* (Aegle marmelos) is mentioned to avoid untoward adverse effects of gold therapy. In *Rasatarangini*^[37-38], *swarna* in form of *swarna lavana* is mentioned for the first time in texts and *shuddha* gold can be used in two ways. i.e. By rubbing and by making *mandala*.

d) **Aanandkand (A. K. Kri 2/46) & Rasatarangini^[39]:**

Properly prepared gold *bhasma* is *madhura*, *tikta*, and *kasaya* in taste, *madhura* in *vipaka*, *pichchhil* (Lubricous), *pavitra* (Sanctified), *bhrinhaniya* (nourishing properties), useful for eye, *sheetal*, *veeryavardhak*, *balakarak* (strength providing properties), *guru*, *rasayana* (rejuvenative properties), useful for heart, *medha* (Intellect), *smriti*, *budhhi*, *ayu* (life longitivity), *kanti* (Lustre), *vanisudhdhi* (purification of voice), and useful in both type of poison (*sthawar and jangam*), *chhaya*, *unmada*, *tridosha*, *jwara* and *shosha* (emaciation).

7. Bhava prakasha Nighantu :

Gold made tongue cleaners are mentioned because of their properties like *dosahrit* (pacifying dosha), *dristid* (good for vision),

and *pathya* (congenial)^[40]. *Swarna* (gold) is mentioned in *dhatvadi varga* where its origin, *uttam lakshana* (qualities), *nikrishta lakshana* (Despised Qualities), *Guna of samyaka* (qualities of properly prepared) and *asamyakamarita* (improperly prepared) *swarna* (gold) *bhasma* are given^[41].

8. Kashyapa Samhita:

Administration of colloidal gold using fine particles of metallic gold or *swarna bhasma* has been advised in *Ayurveda* in infants and children in various forms. *Swarna prashan* described in *Kashyapa samhita* is intended to boost memory, intelligence and immunity in infants^[42].

Pharmacological & Therapeutic Properties^[43-44]:

Rasa - Madhura,

Guna - Snigdha, Laghu

Vipaka - Madhura

Virya – Shita

Doshaghanata – Tridoshashamak.

Karma -Vrushya, Ayushaya, Varnya, Balya, Dipana, Shwasa Kasahara, Aruchi, vishamjwaranashaka, Bruhana, Vajikara, Rajyakshmahara, Ojowardhana, Pandunashan, Sarvavishapaham, Garharam, Granhnanyadi doshanashanam etc.

Table:1 (Formulation of gold present in different classics of Ayurveda)

S.No.	Name of drugs	Disease
1.	Vasant Kusumakar Rasa	Prameha

2.	Shwasa Kasa Chintamani Rasa	Shwasa, Kasa
3.	Brhat Vata Chintamani Rasa	Vatavyadhi
4.	Kumarkalyan Rasa	Balarogadhikar
5.	Brahmi Vati	Manoroga, Hrid Daurbalya
6.	Purna chandridaya Rasa	Rasayan Vajikaran
7.	Jayamangal Rasa	Jirna Jwara
8.	Sutasekhara Rasa	Amlapitta Chikitsa
9.	Brhat Garbha Chintamani Rasa	Sutika Roga Chikitsa
10.	Suvarna Malini Vasanta Rasa	Rajyakshma
11.	Vangeshwar Rasa	Prameha, Soma Roga
12.	Yogendra Rasa	Vatavyadhi
13.	Chaturmukh Rasa	Vatavyadhi
14.	Vata Gajankush Rasa	Vatavyadhi
15.	Panchamrita Rasa	Sarva Jwara

Uses of Gold in recent era

In the new pharmacopoeias of 17th century, use of gold could be found and was advocated by Nicholas Culpepper for treatment of ailments caused by a decrease in the vital spirits, such as melancholy, fainting, fever and falling sickness. Later in the 19th century, for treatment of syphilis, a mixture of gold chloride and sodium chloride i.e. muriate of gold was used. In 1890, the German bacteriologist Robert Koch proved that gold cyanide was bacteriostatic towards the tubercle bacillus. Gold therapy for tuberculosis was subsequently introduced in 1920s. After 30 year debate, a clinical study sponsored by Empire Rheumatism

Council confirmed the effectiveness of gold compounds against rheumatoid arthritis. Since that time gold compound drugs have also been used to treat a variety of other rheumatic disease including psoroatic arthritis, a form of arthritis associated with psoriasis, juvenile arthritis, palindromic rheumatism and discoid lupus erythematosus.

Immuno-modulator & anti-inflammatory

- 1) Swarna prashan can be administered in children as an immune enhancing drug in early ages as this period until one year is considered to be the most vulnerable time for infections due to immature immune system. Clinical and pharmacological studies document immunomodulatory,

nootropic as well as therapeutic effects of *swarna prashan* therapy^[45].

Pharmacological studies revealed specific and nonspecific immune response, which were modified in a positive manner in *swarna bhasma*-treated mice. It also had a stimulatory effect on peritoneal macrophages, which may be helpful to fight against infections.^[46-47]

- 2) *Swarna Bhasma* mixed with *ghrita* and *madhu* were given to children and after 6 months there was increase in mean levels of immune-globulins (IgG, IgM, IgA), significant reduction in duration, severity, frequency of illness^[48]. *Shadguna makaradhwaja* (Mercurial preparation of sulphur and gold in the ratio of 1:8:48) is having better anti-diabetic activity and *Triguna makaradhwaja* (Sulphur and gold in the ratio of 1:8:24) is having better immune-modulatory activity. Further *makardhwaja* has no effect on humoral antibody formation but it has significant modulatory effect on cell mediated immunity against the alum adjuvant induced immunological paw oedema in mice. This indicates presence of specific immunomodulatory activity^[49].
- 3) In vitro study of gold on sheep vesicular gland dioxygenase system showed inhibited prostaglandin synthesis. Two human epidermal enzymes were also

inhibited by gold. These findings show some possible mechanism of gold action in pemphigus such as interruption of inflammatory cycle and inhibition of skin enzymes involved in blister formation^[50].

Treatment of Cancer

- 1) Colloidal gold provide surface for easy conjugation of ligands, including antibodies which can be used for immune-targeting of the nano-particles to particular biomarkers of cancer cells. The intense surface Plasmon absorption of gold nano-particles, followed by rapid photo-thermal conversion, has been used for the selective photo-thermal treatment of cancer by using a suitable immune-targeting strategy^[51].
- 2) A gold compound was clinically applied to patients showing a high level of tumor-associated antigens. 2 patients showed no clear evidence of recurrence except for a high level of tumor-associated antigens. The gold compound was injected IM every week at the dose of 25 mg/body for 10 times to a patient showing a high CEA level that had arisen eight years after cervical dissection for a tongue carcinoma. It was also administered every other week for 30 times at the dose of 25 mg/body to a patient showing high CA19-9 and SLX levels five years after palliative left pulmonary resection followed by radiation therapy for

left pulmonary carcinoma. The CEA level dropped to the normal limit after 10 injections and remained at that level after cessation of the gold treatment. No side effects such as lowering of white blood cell count, BUN elevation, or kidney dysfunction were seen [52].

- 3) B-chronic lymphocytic leukemia (CLL) is an incurable disease predominantly characterized by apoptosis resistance. The induction of apoptosis with gold AbVF was significantly higher than the CLL cells exposed to only AbVF treated cells showed significant down regulation of anti-apoptotic proteins and exhibited PARP cleavage [53].

Treatment of arthritis

- 1) In 1935 Forestier reported [54] the results of a six year study supporting the beneficial effects of gold salts in slowing the evolution of RA. He continued to be a champion of chrysotherapy until his death in 1979. Later double blind clinical studies by the Empire Rheumatism Council (1961) confirmed Forestier's observations, documenting the benefit of sodium aurothiomalate in RA. Radiological evidence of the benefit of gold salts in RA was reported by John Sigler [55]. He observed that gold salts slow down and often eliminate the progressive chronic joint changes associated with RA.

- 2) Auranofin is a lipophilic coordination complex of gold established by a phosphine and a thiolate ligand. It exists as a monomolecular species both in the solid state and in solution [56]. In contrast, conventional gold compounds have gold [57] coordinated between two thiolate ligands. These compounds are very hydrophilic and polymeric in solution. The lipophilic and monomolecular solution properties of auranofin may facilitate its transport across biological membranes and make it more readily available to modify cellular processes, thus accounting for its oral efficacy.

Free radical scavenging activity

Swarna bhasma has shown Free radical scavenging activity during planned experimental studies. Two key enzymes viz superoxide dismutase (SOD) and catalase were measured after oxidation insult with acetic acid in both *swarna bhasma* treated as well as control animal serum and/or liver homogenate. *Swarna bhasma* enhanced activity of SOD (267% in case of serum SOD and 75.8% in case of liver homogenate, SOD activity compared to the respective controls) and catalase (80% compared to control haemolysate) which can be correlated with the improved pathophysiological conditions of the patients [58].

Augmentation of non specific immunity

Male mice were administered with the incremental doses of the drug orally for 10 days. Parameters of study included body weight, organ weight, peritoneal exudates cell (PEC) counts and phagocytic activity of PEC. *Swarnabhasma* significantly ($P < 0.001$) increased count of peritoneal macrophages and stimulate phagocytic index of macrophages^[59].

Treatment of asthma

- 1) In steroid dependent asthma, the efficacy of parenteral gold therapy was evaluated. Five of eight patients improved in terms of reduced steroid requirement while they were maintaining or improving lung function. Two patients developed significant proteinuria that resolved with cessation of gold. Chrysotherapy appears to have a corticosteroid- sparing effect in some patients^[60].
- 2) In the case of non-specific bronchial hyper-responsiveness 12 weeks after treatment with auranofin was decreased compared with that before treatment with auranofin and 12 weeks after treatment with inactive placebo, although the treatment did not improve pulmonary function tests^[61].

Reproductive Health:

- 1) Gold has been used for treating male infertility in *Ayurveda*. Semen analysis by atomic absorption spectrophotometry. The

value of gold in semen in a range of 0.36 to 1.98 $\mu\text{g/ml}$ ^[62] showed. A clinical study carried out on *chandrodaya rasa, swarna* containing formulation on its efficacy on *shukrashaya* (oligospermia) showed statistical significant result in spermatogenesis. There was no significant improvement in the volume which reveals that drug improves the semen qualitatively rather than quantitative^[63].

- 2) Significantly increase in ovarian and uterine weight hydroxysteroid dehydrogenase activity and elevation of serum estradiol level were observed following gold chloride (0.2 mg/Kg body weight/day, S.C. administration in immature female albino rats. Histological study of ovary also showed graafian follicle with ovum in rats providing stimulation of reproductive function^[64].

In Mental Health

- 1) Gold reduces the effects of depression, as well as enhances the ability to focus^[65]. Studies also document the efficacy of gold in mental disorders. The biological and biomedical applications of gold nanoparticles as intracellular carriers of specific molecules (e.g., a drug, antibody, or oligonucleotide) to the brain, a thorough understanding of the interplay between intracellular gold nanoparticles

and neuronal intrinsic properties is necessary^[66-67].

- 2) In Unani-Tibb, *Swarna* (Gold) *bhasma* used in *Kustha Tila Kalan* and in modern medicine, Auranofin used, were subjected to elevated maze test, videopath analyzer etc. anxiolytic activity, behavioral despair and learned helplessness tests for antidepressant activity, haloperidol induced cataleptic tests for neuroleptic activity and haematological parameters for safety evaluation in rats and mice. The traditional gold preparations exhibited anxiolytic, antidepressant and anti cataleptic actions with wide margin of safety^[68]. *Makaradhwaja*, a gold containing formulation lowered neutrophil and total leucocytes count. Serum cholesterol, urea, glucose, was decreased. Haemoglobin and serum creatinine were increased. *Makaradhwaja* showed significant change in oxidation stress scavenging system confirming effect as observed in rats. Antioxidant study showed significant increase of lipid per oxidation^[69].

Effect on cognition

Abraham et.al (1998) explored the potential of colloidal gold as a neuroprotective agent. Encouraged by pilot work suggesting improvement in cognition and well being, they conducted a study to see whether gold could improve cognitive functioning. They tested cognitive abilities

using the Weesler Intelligence Scale before and after 4 weeks on colloidal gold at 30mg/day. After 4 weeks on colloidal gold there was 20% increase in IQ scores^[70].

DISCUSSION

Ayurveda is the traditional medical system of India. Its origin dates back an estimated 5-10,000 years, and it is widely considered to be the oldest form of health care in the world. The knowledge of *Ayurveda* has its written origins in the *Vedas*, the sacred texts of India, believed to be the oldest writings in the world. Written in *Sanskrit*, the *Vedas* cover a vast number of subjects from grammar to health care. The *Vedas* were written approximately 2500BC or earlier. Current knowledge about *Ayurveda* is mostly drawn from relatively later writings, primarily the *Charaka Samhita* (approximately 1500BC), the *Ashtang Hridaya* (approximately 500 AD), and the *Sushruta Samhita* (300 - 400AD). These three classics describe the basic principles and theories from which *Ayurveda* has evolved. They also contain vast clinical information on the management of diseases.

Historically India probably was the first to maintain records of useful drugs. *Charaka*, the great *Ayurveda* scholar of 1500 B.C. has mentioned the types of drugs on the basis of source, various formulations and surprisingly the pharmacology of drugs with considerable precision^[71]. The later treatises describe the

medicinal properties of various metals like mercury, gold, lead, etc. The *bhasmas* containing heavy metal salts are currently enlightened mainly from the toxicological point of view ^[72-74]. The ancient *Ayurveda* scholars have mentioned the ill effects of improperly prepared metallic preparations and emphasis has been given to rational preparation methods through various pharmaceutical processing like *shodhana* (purification), *marana* (incineration), etc. Gold purification has been explained in *Arthassthra* (2.13.31). Gold preparation from mercury (*Rasa Vedhaja*) is also mentioned in *KautilyaArthashastra*.

In ancient times, the use of gold is mentioned to increase intellectual powers and longevity of life through the procedure of “*swarna prashna*”. The classical descriptions of *swarnaprashan* therapy uses metallic gold-rubbed on a clean rubbing stone with water, till fine gold particles are released. The rubbed gold or gold powder mixed with fine powder of *medhya*, *rasayana* herbs, *ghee* and *honey* is given to the newborn. Rubbed gold in metallic form carries the risk of toxicity. Hence, a safer option of *swarna bhasma* is being used for the *Swarna prashan* nowadays. *Swarna prashan* is modified as per the convenience of people on the day of holy star every month and periodicity is maintained. General public is also sensitive regarding such issues and a holy day

gives mental satisfaction. Further, *Sushruta*, clearly mentioned that all *swarna* (gold) preparations are more useful and powerful when it is administered on the day of *Pushya-Nakshatra*^[75].

In the new pharmacopoeias of 17th century, gold cordial could be found for treatment of ailments caused by a decrease in the vital spirits, such as melancholy, fainting, fever and falling sickness. Further, with the convergence of modern medicine, *swarna lavana* i.e. Gold Chloride / colloidal form of gold were also incorporated in *Ayurveda* system of medicine. Gold chloride has found place in British Pharmacopoeia. Most common use of gold is in Rheumatoid arthritis, asthma etc. may be by the virtue of its immunomodulatory/immunosuppressive properties. The results are interesting in view of reported suppressive effects of other gold preparations^[76].

Reported Gold Toxicity:

Swarna is placed under *shuddha loha* (pure metals) ^[77]. In general gold is considered the purest amongst all the metals, used in the *Ayurveda* system of medicine; hence according to the Acharya *Yashodhara* its *sodhana* is not necessary^[78]. According to *Rasendra sara Samgraha* and *Ayurved Prakasha*, impure gold is likely to be harmful. Such gold when used internally may cause loss of *saukhya* (health), *virya* (potency), *balahani* (loss of strength) and

produce various diseases. Though no specific treatment is given for these conditions but Bilva phala (Aegle marmelos Carr.) is mentioned to avoid untoward adverse effects of swarna (gold) therapy.

It has been found that there are at least three form of gold induced side effects namely painful neuropathies occasionally accompanied with insomnia and anxiety, peripheral neuropathy and encephalopathy with symptoms like depressions and delirium [79].

Gold containing *Ayurveda* preparation, *swarna vasant malti*, was investigated for safety. The *bhasma* was given to 20 male persons at a dose of 100 mg twice a day for 40 days under supervision of *Ayurveda* physicians. The total cumulative intake of 160 mg of gold at the rate of 4 mg/day in this form did not have any toxic effect on human body, as evidenced by clinical examination, unaltered body weight, absence of urinary pathology, and by 30 sensitive biochemical and enzymatic tests [80].

CONCLUSION

Present review reveals that gold has been used since the ancient time for ornamental as well as maintenance of health. Vedas, *Ayurveda* and many other ancient classics provide evidences regarding the use of gold for health benefits. Present clinical studies also document the efficacy of gold in various diseases. Nano particles of gold in various

lehana forms can also be absorbed directly into the blood stream through sublingual route. *Lehana*(supplementary feeds) of *swarna prashana* (gold) can therefore be administered in all children as it acts at the level of nutrition, metabolism, growth and development, physical strength and immunity. A large number of research studies reveal that gold in various forms is beneficial as immuno-modulator anti-inflammatory, free radical scavenging activity, augmentation of non specific immunity, in reproductive health, in mental health, effect on cognitive functions, and treatment of cancer, arthritis, and asthma which indicates that gold can be successfully applied in maintenance of human health and treatment of diseases.

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