REVIEW OF LITERATURE
2. REVIEW OF LITERATURE

The literature pertaining to the occupational hazards in general and health hazards in sericulture industry have been reviewed and presented as under.

2.1 Occupational hazards:

Occupational asthma has been recognized as a cause of work-induced respiratory disability. Increased recognition is probably coupled with a true increase in prevalence as both old and new causative agents are being more widely used in industry (Warren et al., 1989).

Occupational asthma has been defined as asthma caused by exposure to dusts, gases, vapors or fumes in the workplace (Taylor, 1990). By convention and in some places by definitions, occupational asthma has been limited to those conditions, in which asthma is caused by a sensitizing agent, either an IgE-mediated inhalant allergen or a low molecular weight sensitizing chemical (Warren et al., 1989).

Subjects with IgE-mediated sensitivity to high molecular weight protein-containing chemicals are, by definition atopic. They frequently have a past history of other atopic complaints including allergic conjunctivitis, allergic rhinitis, eczema and even atopic asthma. Exposure to any allergen in the workplace generally causes a classic illness characterized by acute rhinitis and conjunctivitis and often acute wheezing, these being the clinical equivalents of the early allergic responses. Delayed or prolonged wheezing and rhinitis are the clinical equivalents of
the late allergen induced sequelae including the increased airway responsiveness. Historical identification of allergen or potential allergens in the work place is generally easy but occasionally may require some detective work (Cockcroft, 1990).

Brewery workers were reported to have asthmatic symptoms after using chloramine powder as a sterilizing agent. Positive wheal and flare reactions to skin-prick tests with solutions of chloramine at strengths that caused no reactions in unexposed controls were reported. The symptoms were not reported to recur once the men had been removed from areas in which chloramine was handled. (Bourne et al., 1979)

Some of the agents in the working environment induce asthma by effects similar to those of pharmacologic agonists. In these situations, it is expected that there should be a dose-response relationship between exposure and response. When the dose is high enough, all exposed subjects are expected to develop broncho constriction. Considerable controversy has been raised as to whether these agents, by causing reversible airflow obstruction, really give rise to "asthma" in the usual sense because they do not give rise to eosinophilia or nonspecific bronchial hyper reactivity. Organic high molecular weight compounds, such as proteins, polysaccharides, glycoproteins and peptides are reported to induce allergic response by producing specific IgE antibodies and some times specific IgG antibodies. Some of the causes of occupational asthma arising from exposure to animal products, insects, plants and biological enzymes were reported. It was reported that in most instances, positive immediate skin test reactions could be elicited with extracts of the offending agents and
specific IgE antibodies to these antigens. Atopic subjects were reported to get affected more frequently than non atopic subjects. (Chan-Yeung and Lam, 1986).

Occurrence of byssinosis has been reported in textile workers exposed to dust of cotton, flax, hemp or jute. The characteristic symptoms reported were chest tightness, cough and labored breathing several hours after the patient returns to work. The prevalence of byssinosis was reported to be higher among workers with the most exposure, such as during ginning, opening or carding and lowest in those with the least exposure, such as during slashing or weaving. Prevalence was found to increase with the duration of exposure. (Zuskin et al., 1969; Fox et al., 1973; Imbus and Suh 1973; Merchant et al., 1973; Jones et al., 1979)

The prevalence of occupational asthma is reported to vary depending on the nature of the industrial agent, the concentration of exposure and the working conditions. Murthy et al., (1988) conducted a pilot study relating the morbidity of coir workers to identify the risk factor or aggravating factors that exist in coir operations and reported a higher rate of morbidity in coir workers compared to other workers of similar socio economic status and the majority of the illness were reported from weaving and spinning processes.

Peripheral blood eosinophilia is associated with asthma and increased airway responsiveness in Western countries with low prevalence of parasitic diseases (Tollerud, 1991; Jansen, 1999).
Vermeulen et al., (2002) and Le Mouflal et al., (2004) reported that the occupations that contribute to asthma are in particular industries such as construction, metal work, rubber work, plastic work, printing, and industrial cleaning.

Chan-Yeung and Malo (1995) stated that exposure is the most important determinant in the development of occupational asthma. In a review of studies on occupational asthma with latency, it was observed that the higher was the degree of exposure to an occupational agent, the higher was the prevalence of asthma (Chan-Yeung, 1990). This concept was proposed again by Frew (2003), who stated that, in general, the higher the level of exposure, the more likely the sensitized person is to develop asthma. Once a subject is sensitized, the main factor that influences the onset of symptoms is the degree of exposure (Venebles & Taylor, 1990; Nieuwenhuijsen, 2003). However, there is still a lack of information regarding the risk of sensitization at low concentrations and the existence of a "no-effect level" (Heederik & Houba, 2001). For isocyanate-induced asthma, one study has suggested that peak exposures could be more relevant than the cumulative dose of exposure (Leroyer et al, 1998); another stated that continuous exposure rather than intermittent acute exposure to high concentrations of isocyanates increased the risk of developing symptoms of asthma (Mastrangelo, 1995).

Majority of the studies reported in occupational asthma are single case reports, descriptions of a number of cases, and prevalent studies. Long-term prospective studies, which are the most reliable method of investigating the natural history and
prognosis, are virtually nonexistent. The overall prevalence of occupational asthma is unknown. In Japan, it has been estimated that 15% of all adult male asthmatics suffer from asthma caused by occupational exposure (Kobayashi, 1980). In the United States, 2% of all cases of asthma are thought to be of occupational origin (Salvaggio, 1979).

Jaggi (1992) mentions that some occupations are particularly hazardous for people with an allergic background or for those who have some manifestations of allergy already in them. Farmers, poultry men, dairy workers and bakers are exposed to large amounts of fungus spores. Gardeners, farmers and farm labourers are exposed to a large number of pollen. Upholstery and mattress renovators are exposed to large quantities of house dust, flour mill workers and carpenters are exposed to various kinds of dusts.

Kanaka Rao and Rajmohan (1991) reported that occupational exposures are responsible for 2 per cent of all cases of asthma, although the incidence may be higher in certain parts of the world.

Weeke (1987) mentions that the prevalence of rhinitis due to occupational factors is approximately 5 to 15 per cent in the workers. High risk persons are those with allergy and allergic diseases in the family.

Murthy and Anand (1991) reported that the allergic rhinitis can begin at any age. Incidence of onset is greatest in children and young adults. Male and females are affected equally.
McFadden (1991) mentions that bronchial asthma occurs at all ages but predominantly in early life. About one half of the cases develop before age of 10 and another third occur before age of 40 years. In childhood there is a 2:1 male/female preponderance which equalizes by the age of 30 years.

Chaubey and Heda (1973) in their observation reported that the blood eosinophil count ranged between 1 to 8 per cent in 82 cases and only in 6 cases it was more than 10 per cent.

Davies (1995) reported that the patients with asthma might have an increase in the number of eosinophil in peripheral blood more than 4 per cent.

Subhakar et al., (1991) reported that the absolute eosinophil count ranged between 100-500 in 23.6 per cent, 500-1000 in 61 per cent, 1000-5000 in 15.2 per cent of allergic patients.

### 2.2 Health Hazards in Silk Industry:

Symptoms of carbon monoxide toxicity consisting of headache, sometimes nausea and vomiting, usually not severe, was reported in Japan, where sericulture was a common industry as a result of the use of charcoal fires in poorly ventilated rearing rooms. Dermatitis of the hands of female workers reeling raw silk was quite common in Japan, wherein 1920s, a mortality rate of 30-50% among reeling workers was reported. An unusual out break of tonsillitis among silk spinners was traced to bacteria in the water of reeling basins.
and in the ambient air of the cocoon department. A situation causing respiratory distress among spinning, frame workers when packing or repacking silk on a spinning or winding frame has also been reported (Kubota, 1983)

Wild silk allergy has been described in recent years as a cause of nightly asthma due to contact with bedcovers containing wild silk or silk waste (Hacki et al., 1982). Possible allergens are either products or parts of the silkworm Antheraea pernyi, the producer of true wild, or tussah, silk, or of Bombyx mori, the producer of cultivated silk in the case of wrongly labeled products. Another possible allergen derived from an insect of the genus Anthrenus, which feeds on cocoons and other insects and has been found as a contaminant in silk waste-containing bedcovers (Johansson, 1985).

Asthma characterized by cough, tightness of the chest and wheezing was reported among workers in silk filatures involved in different occupations like sorting, steaming, boiling, reeling and skeining. Occupational asthma was found to be more pronounced in subjects from sorting, cooking and reeling sections (Harindranath et al., 1985).

The allergenicities of the two groups of silk used in China, mulberry and wild, are reported to be very similar (Johansson et al., 1985) However, allergy to mulberry silk is more frequent in China than is allergy to wild silk because mulberry silk is more commonly used. The final textile products of silk, however, are most often nonallergenic (Chaoming et al., 1990). Sensitization to mulberry silk can be
attributable to allergens in the silk cocoon, silkworm pupae, and unprocessed silk threads. Silk workers involved in sorting or cooking the cocoons and in reeling, or degumming the threads can be sensitized to silk by inhalation of airborne allergens (Harindranath et al., 1985).

In the silk industry occupational IgE-mediated hypersensitivities to different allergens are well known. Since the silk waste is used for filling of bed quilts, a great number of patients suffering especially from silk-asthma could be observed. Immunological investigations showed clearly that in this context sericin and also antigens from an insect of the genus Anthrenus in the silk material are of allergenic importance (Ebner and Kraft, 1987).

Choaming et al., (1990) reported silk to be a highly potent allergen. Studies were conducted on children less than 15 years of age with asthma. The patients were evaluated with complete medical histories, skin tests, conjunctival and/or nasal provocation tests and laboratory studies including total IgE, IgE-Sw and Sw precipitating antibody measurements. The average mean wheal diameter elicited by silk in prick testing was larger than two histamine equivalent prick tests.

Uragoda and Wijekoon (1991) reported that the declining prevalence of occupational asthma in the three silk processing stages, viz., twisting, degumming and weaving to be in line with the worker's declining exposure to dust.

Dandin et al., (1993) have reported the contribution of various activities of sericulture towards environmental pollution.
and the effect on human health and society. The repeated use of formalin for disinfection in silkworm rearing is reported to have some effect on health. The release of scales and dust due to the fluttering of moths in the grainages is said to cause respiratory disorders in workers due to the inhalations of scales. The colouring matter, sericin, matters from the pupae are reported to make the water highly coloured and turbid creating environmental problems when released into the water bodies.

People engaged in different activities of silk manufacture are known to be at risk to develop bronchial asthma believed to be allergenic in nature. Asthma could be triggered by fine scales in the air released by the fluttering of the silk moth. Inhalation of fumes during acid treatment of bivoltine eggs and dyeing of silk fabrics using acid bath may cause respiratory disorders. Use of formalin and bleaching powder as general disinfectants without certain precautionary measures causes burning of eyes, mucus secretion and peeling of skin. The use of dust formulations during silkworm rearing may cause respiratory disorders and burning of eyes. During silk reeling, the smoke emitted from cocoon cooking stoves from the firewood and the stench from steam causes asthma. The people engaged in silk reeling units are prone to fungal and other skin infections like dermatophytosis due to constant immersion of hands during silk reeling in hot and tepid water. The feet also get infected due to the constant contact with damp floors caused by improper and unhygienic drainage system in reeling units. (Maribashetty et al, 1997)
Murthy et al., (1998) conducted dust quantitation and medical survey on male workers engaged in three silk grainages located at three different places in Karnataka. Dust hazard was reported to be of concern in the silk grainages. Dust levels at the work spots were attributed to the absence of personal protective device and cross ventilation of the congested nature of the rooms. The common medical complaints reported include cough, dyspnoea and pain in abdomen. Most frequent symptoms reported were attributed to the allergens released in the environment.

Sadayuki Kurosaki et al., (1999) reported that braided silk sutures often act as a non-immunologic foreign-body and cause granulomatous inflammatory reaction years after surgery. A case of recurrent granulomas was reported with remarkable infiltration of eosinophils that may have resulted from an IgE-mediated hypersensitivity reaction to silk fibroin, a component of the braided silk suture. As under normal circumstances exposure to fibroin is rather rare, the present patient may have developed this reaction to the silk sutures used in a previous surgery.

Celedon (2001) reported that children who were sensitized to silk had 2.6 times higher odds of having asthma than did nonreactors. This association between sensitization to silk and asthma became stronger and of greater statistical significance after inclusion of the eosinophil count of the participants in the multivariate model, as either a categorical variable or a linear term.
Medical examination of two hundred children aged six to fourteen years, working in reeling and twisting in Ramanagaram and Channapatna taluks of Bangalore Rural District have revealed high rates of respiratory diseases and skin infections. It was also reported that children had complained of cuts and other injuries from threads and machines; headache; pain in the back, legs, neck, and abdomen; colds and bronchitis; hearing loss; and vision problems. The noise from the twisting factories was reported to be deafening, and employers often played loud music in the mistaken belief that it would prevent hearing loss from the machines. Dim lighting inside the factories and the close eye children must keep on the threads and machines also was the cause for vision loss (MAYA, 2002).