The crystallin lens of the eye is positioned behind the iris, with its posterior aspect embedded in the vitreous body (Johns et al., 2003). The remarkable property of the lens is to play a passive role in the process of accommodation, wherein light rays pass through the cornea and aqueous humor, and are focused upon the retina. The lens is formed from ectodermal tissue and contains epithelial cells that give rise to lenticular fibres throughout life; hence, with increasing age, the lens becomes more compact and thicker. If the lens loses its optical clarity for any reason it is called a cataract (Floyd, 2000; Johns et al., 2003).

Cataract is the leading cause of visual impairment responsible for blindness. The World Health Organization (WHO) estimates that there are 180 million visually-disabled people worldwide, and that 40-45 million of these are without useful vision i.e., they are unable to walk about unaided (WHO, 2000). An estimated 46% of these cases are the result of cataracts (WHO, 2000). Cataracts can have various causes, including developmental abnormalities, trauma, metabolic disorders, and drug-induced changes (Johns et al., 2003). The main cause of visually significant cataracts is ageing (Asbell et al., 2005), and hence, age-related (senile) cataractogenesis is the focus of this thesis.

Although removal of the cataractous lens and implantation of an intraocular lens effectively treats this condition and restores good vision, cataract surgery is not without complications, particularly in an elderly patient. Additionally, the provision of cataract surgery requires trained ophthalmologists, use of expensive operating facilities and microsurgical equipment, appropriate postoperative follow-up management and refractive correction (Chong and Wong, 2008). As many of these services are not readily available in developing countries, identifying methods to prevent or delay the
onset of cataract formation in the general population will be a major public health achievement (Chong and Wong, 2008). It has been suggested that delaying the onset of cataract by 10 years would significantly reduce the number of individuals who require surgery and thereby the economic burden (Brian and Taylor, 2001). Prevention of cataract by non-surgical means would not only significantly reduce costs, but also result in reduction of surgical complications. For these reasons, there has been considerable interest in finding an alternative source, that is a non-surgical approach, for the management of cataract.

Cataract is a multifactorial disease associated with several risk factors such as ageing, diabetes, malnutrition, diarrhoea, poverty, sunlight, smoking, hypertension, and renal failure (Harding, 1991). Free radical-induced oxidative stress is postulated to be perhaps the major factor leading to senile cataract formation (Gerster, 1989). This hypothesis is supported by the anticataractogenic effect of various nutritional (Gerster, 1989; Gupta et al., 2003) and physiological (Devamanoharan et al., 1999; Yagci et al., 2006; Geraldine et al., 2006) antioxidants in experimental animals.

Rodents remain the most common experimental animals used to study the mechanism of cataract formation. Selenite cataract is a rapidly-induced, convenient model for the study of senile nuclear cataractogenesis. The morphological and biochemical characteristics of this model have been extensively investigated; moreover, this model shows a number of general similarities to human cataract. The reliability and extensive characterization of selenite cataract makes it the best rodent model for rapid screening of potential anticataract agents (Shearer et al., 1997). Various natural and synthetic compounds, of differing chemical structures, have been reported to prevent selenite-induced cataract in vitro as well as in vivo (Tamada et al., 2001; Gupta et al., 2003, 2005; Doganay et al., 2006; Geraldine et al., 2006; Elanchezhian et al., 2007;
Isai et al., 2009) by virtue of antioxidant properties. However, there is a need to evaluate additional compounds for their anticataractogenic effects.

Recently, great emphasis has been laid on exploring the possibility of using natural resources to delay the onset and progression of cataract. It is now well-established that a diet rich in fruits and vegetables is associated with a reduced risk of oxidative stress-mediated diseases such as cancer and cardiovascular and neurodegenerative diseases (Halliwell, 1994). The beneficial effects of fruits and vegetables on human health are attributed to their high levels of a wide variety of phytochemicals, of which phenolics constitute the greatest proportion (Seeram et al., 2005). Ellagic acid is a phenolic compound present in fruits and nuts, including blueberries, blackberries, raspberries, strawberries and walnuts (de Ancos et al., 2000; Anderson et al., 2001; Sellappan et al., 2002). Ellagic acid has a variety of biological activities including anti-oxidant (Priyadarsini et al., 2002), anti-inflammatory (Iino et al., 2002), anti-fibrotic (Thresiamma and Kuttan, 1996) and anti-cancer (Narayanan et al., 1999; Khanduja et al., 1999) properties. Ellagic acid has been reported to protect ischemia/reperfusion-induced gastric injury (Iino et al., 2002) and carbon tetrachloride-induced liver fibrosis (Thresiamma and Kuttan, 1996). The anti-cancer properties of ellagic acid include induction of cell cycle arrest and apoptosis (Narayanan et al., 1999), and inhibition of tumor formation and growth in vivo (Khanduja et al., 1999). Although the molecular mechanisms responsible for this protective effect remain largely unknown, the superoxide anion and hydroxy anion-scavenging action by ellagic acid is a possible reason for this protective effect (Priyadarsini et al., 2002; Iino et al., 2002). Further, ellagic acid has also been reported to inhibit lipid peroxidation and 8-OhdG formation in vitro and in vivo (Cozzi et al., 1995; Takagi et al., 1995; Laranjinha et al., 1996; Iino et al., 2001). Khanduja et al. (1999) have reported that compared to quercetin, ellagic acid is a more potent antioxidant in increasing the reduced glutathione (GSH) content and in reducing lipid peroxidation.
In view of these beneficial effects of ellagic acid, it was felt worthwhile to investigate whether ellagic acid could exert anticataractogenic effects through its antioxidant properties, since oxidative stress has been implicated in cataractogenesis. This hypothesis was evaluated in the present study by determining certain putative mechanisms of ellagic acid to prevent or retard lenticular opacification in an \textit{in vivo} cataract animal model. The efficacy of the compound was tested by evaluating morphological and various biochemical parameters. The mechanisms underlying the action of ellagic acid in preventing cataractogenesis were evaluated by assessing its efficacy in maintenance of redox balance and calcium homeostasis in the lens. The study also included the evaluation of antiapoptotic effect of ellagic acid. In addition, the protein alterations in selenite cataracts and prevention of these alterations by treatment with ellagic acid were also studied. Thus, a multi-pronged approach has been executed to evaluate the efficacy of ellagic acid in preventing or delaying the onset of cataract.