INTRODUCTION

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Longevity is one of the characteristics of today's world. The ageing of population, already in evidence in developed countries, is becoming a reality in less developed countries. However, not all individuals age in a similar way. In biological terms, aging is a dynamic process that represents the molecular, biochemical, physiological and structural changes that take place in an individual following the cessation of growth (Dey, 2003). In this context, the health of the elderly, in terms of physical and mental status, become crucial. While there is increasing concern about medical facilities and care of the elderly hardly any attention is paid to the aspects related to mental health. Both the well-being of the individual at this point in life and the individual's harmonious integration into society, are at stake. As people grow older their mental health gets compromised. At the age of 65 years and above people are more prone to have mental health problems than at any other age.

The number of people aged 65 years and above account for 7% of the world's population: two-thirds (65%) of those aged 80 years and above are female. Global strategies must take gender differences into account. A major challenge is to develop innovative ways of tackling the special health and welfare problems of elderly women (WHO, 1997). Mental disorders are projected to increase to 15% of global disease burden by the year 2020 (Lewis and Araya 2001).

Elderly individuals face a higher risk of developing mental as well as physical morbidity. Their vulnerability to mental problems is due to aging of brain, physical problems, socio-economic factors, cerebral pathology, emotional attitude and family structure. In most of the cases, mental illnesses coexist alongside physical problems in the elderly person. Mental illnesses that predominantly affect older people include memory loss, depression, dementia, and many others. Upto 10 percent of the elderly have memory problem significant enough to interfere with their ability to function independently (Ganguli, 2000).

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Ageing women face increasing obstacles to their mental health due to number of factors like, her life course medical history and present physical health, lifestyle, work, social protection, care giving responsibilities, socio-economic status, marital status, access to health services, dependence on other family members and her long-term exposure to violence and discrimination.

Globally, aging is being feminized. Majority of women, particularly in patriarchal social structure like India, often lack necessary skills to maintain a healthy physical and mental status. In old age, these problems get compounded with deterioration in physical condition and unsupportive social environment. In turn the mental health and perceived stress influences aging process of women (WHO Fact Sheet, 2009)

There is an estimation of 2.8 million adults with common and severe mental disorders at any given point of time in Gujarat. The occurrences of natural disaster and communal violence in recent past are understood as significant contributors to the number of reported cases of depression, trauma and anxiety (Government of Gujarat Mission report, 2003). Amongst all mental disorders, depression is one of the most common psychiatric disorders that can affect anyone regardless of age, race, class or gender. Sometimes it is referred to as 'common cold' of mental illness.

There are more than 40 crore men and women in the world suffering from depression out of which 4 crore are from India (Vaishnav.M, 2002). The chances that a woman will experience major depression sometimes during her lifetime range from 10 – 25% (APA, 1994). Depression is consistently more common in women than in men at a ratio of approximately 2:1 (VenkobaRao, 1983). Amin et al (1998) found from their study on depression in Gujarat that being women, divorced, widowed and belonging to unitary families were associated with increased depression.

Depression is seen as a natural consequence of ageing, loss and physical illness (by patients, their families and professionals), and therefore it is not diagnosed or treated. Some symptoms of depression (e.g. loss of interest, social withdrawal) particularly are likely to be misinterpreted in this way.

Older women tend to be either rendered invisible in relation to considerations of mental health or conversely, constructed as potential mental health problems. Data available on mental health and nutritional status of older women with reference to depression is scarce.

Despite of the increasing understanding that depression is a real illness affecting millions of people, there is still a stigma, or shame attached to mental illnesses. Keeping this in view, the present study therefore focused on depressed women.

Depression places excessive burden on individuals, families and the society. Broadhead, Band Tse (1990) found that people with symptoms of depression have 4.8 times higher risk than people without symptoms. Depression is often an exceptionally disabling condition, leading to difficulties in working and carrying out household tasks. Nearly 15 percent of people with depression commit suicide (Rider, 2000). Unlike many physical conditions, depression can also lead to a profound deterioration of relationships with friends, family and work colleagues that can give rise to many problems.

Nutrition can play a key role, both in the onset, severity, and duration of depression. Many of the easily noticeable food patterns that precede depression are the same as those that occur during depression. These may include poor appetite, skipping meals, and dominant desire for sweet foods (Rao, 2008).Depression results in weight loss which adversely affects the nutritional status. Nutritional neuroscience is an emerging discipline shedding light on the fact that nutritional factors are intertwined with human cognition, behavior and emotions. However, nutrition seems to be directly associated with physical and mental well-being of the individual, it needs a specific focus. A study conducted by Mehta and Laddu (2002) on depressed subjects, aged

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45-60 years, revealed that the consumption of Vitamin-C, Vitamin-B6 and Vitamin-B12 was 25% lower than the normal RDA. In a study done by Limaye (1999) on 100 institutionalized elderlies (>60 yrs), in Baroda showed a lower caloric intake as compared to the required RDA and found that depression was one of the common ailments amongst them.

Ortega et al (1997) found association between inadequate intake of carbohydrate, thiamine, folate and vitamin C with cognitive impairment in 260 elderly (65-90 years).

Rue et al (1997) in a study on 137 elderly (66-90 years) reported several significant associations between cognition and concurrent vitamin status (folate, thiamin, riboflavin and niacin). Higher levels in past intake of vitamin A, E, B6 and B12 were related to better performance on visuospatial recall and abstraction test. Clinical deficiencies of B-vitamins in elderly have been implicated in brain related disorders including reversible dementia, depression and electrophysiological dysfunction including convulsions.

Food contributes to the quality of life, through psychological, social and physical mechanisms. Malnutrition is an impairment of health resulting from a deficiency, excess or imbalance of nutrients. Studies show that older adults with poor eating habits are more vulnerable to depression (Krinke, 1999). It has been shown that low levels of the nutrients folate, zinc, Vitamin B6 and Vitamin B12 can lead to an increased risk of depression. And conversely, those who are clinically depressed often do not maintain a nutritionally balanced diet, either by eating too much or too little (Cohen, 2001).

Perrig WJ et al (1997) performed a longitudinal and cross sectional study on 442 subjects aged 65 to 94 years in Switzerland, and found that higher intake of ascorbic acid and beta carotene plasma levels were associated with better memory performance. Results indicated the important role played by antioxidants in aging brain, this may have implications for prevention of progressive cognitive impairment.

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Depression can also be caused by body's inability to produce a neurotransmitter called serotonin, which is normally synthesized in the body from other substances. Serotonin is a natural tranquilizer produced within the body from food. Tryptophan - an essential amino acid and building block of protein - is the forerunner of serotonin. Tryptophan is converted to serotonin - natural calming agent - in the presence of vitamin B6 (Pyridoxine). When there is a deficiency of vitamin B6, tryptophan may be transformed into excessive xanthurenic acid which may cause cancer (bladder), attack the pancreas and cause diabetes (Head KA, 2000). Biggo et al (1974) demonstrated that depriving rats of dietary tryptophan for 24 hours resulted in 90% reduction of brain tryptophan and a 58% reduction of serotonin.The present study aimed at assessing the nutritional status of adult and older women who suffered from depression.

Depression in the older population is a major health issue,both because of its high prevalence and because its adversehealth consequences. About 12% to 20% of community-dwelling older person suffer from symptoms of depression (Blazer DG, 2003). Many cross-sectional studies have demonstrated that, compared with non-depressed persons, depressed older persons have poorer health status, higher prevalence of disability, and more severe comorbidity(Onder G, 2003). In addition, longitudinal studies have shown that depression represents a risk factor for adverse outcomes including increased morbidity, mortality, and incomplete or delayed recovery from illness and disability (Rozzini R, 2002).

Despite of the difficulties in diagnosing the psychiatric disorders in the older population, available data suggest high rates of depression in the older persons. Studies have suggested that, in general, a third of the older population is depressed (WHO, 1999). In India around 4 million people aged 60 and above are said to be suffering from mental illness and two-third of them are diagnosed as depressed (Jaiprakash, 1997).Rao and Madhavan (1997) estimated the prevalence of mental morbidity in those sixty or above at 89/1000 population in semi-urban area. The prevalence of depression in the community varies from 60/1000 (Rao&Madhavan, 1992) to 241/1000 (Rao, 1992).

Depression in the elderly is a widespread problem that is often not diagnosed and frequently under treated. Many older people will not admit to the signs and symptoms of depression, for fear that they will be seen as weak or crazy. Some older people may be aware of their depression, but believe that nothing can be done about it (Timothy A, 2008).

Advancing age brings it with a multitude of major and minor physical ailments. Old age is characterized by increased disability and dependency accompanied with decline in physical & mental functioning and social participation.

Depression in later life frequently coexists with other medical illnesses and disabilities. In addition, advancing age is often accompanied by loss of social support systems due to the death of a spouse or siblings, retirement or relocation of residence. Because of changes in an elderly person's circumstances and the fact that elderly people are expected to slow down, doctors and family may miss the signs of depression. As a result, effective treatment gets delayed. Many seniors find themselves trying to cope with symptoms that could have been easily treated (Matthew H, 2009).

Morely and Silver (1998) found in their study that poor dentition, immobility, inability to feed oneself decreases food intake. Dormenual and associates in the same year carried out a study on elderly subjects aged 30 years and above and found that oral dryness and low salivary inflow associated with loss of appetite and low body mass index among the elderly.

According to a cross sectional study carried out on 4286 elderly British women (60-79 yr) by Adamson et al (2004), nearly 50 % of the subjects had arthritis, 19% had bronchitis, 18% were suffering from depression and 16% from coronary heart diseases. The prevalence of locomotor activity limitation was 37.2% and 35.5% of the women had difficulty with some aspect of social participation.

A study conducted by (Mehta and Bhatt, 2008) on elderly women aged more than 75 years to assess the knowledge and care giving practices by nurses. The results on the assessment of mental health of the elderly subjects revealed that in all, 36% of the elderly suffered from moderate depression and severe depression was observed in 10% of the subjects. Motivala et al (2006), studied 410 elderly Americans and reported that older adults who had a history of depression suffered from sleep disturbance and lower level of health functioning as compared to subjects free from past or current depression. It was concluded that mental health of elderly plays an important role in ensuring their physical health.

Mehta.P and Sharma.M (2009) conducted a study on old elderly (above 85 years) and centenarians. The results of the centenarian's morbidity profile revealed that Dental problems (50%) ranked first in the age group of 65-74yrs followed by endocrine (45%). In case of elderly in 75-84yrs age group most prevalent illness was cardiovascular diseases(57.5%) followed by endocrine(55%).The 85-92yrs age group and 93-104yrs age group however followed a more similar trend with bone related problems in highest prevalence followed by neurological problems(43.3%) in 85-92yrs age group and dental(50%) problems in 93-104yrs age group.

Depressive symptoms in itself lead to minor health problems and are responsible for the aggravation leading to chronic conditions. Mehta.P and Purohit.S (2010) conducted a study on 150 males having moderate depression from the age group of 50 years & above. Further, they were classified into three age groups viz., 50-59 yrs, 60-69 yrs and 70+yrs. The results revealed that bone related problem were more prevalent in 70+ years of the males with 56% compared to 36% in 50-59 yrs of age group, followed by 42% in 60-69 yrs of age group. The most common complaints in the younger group were lethargy, body aches, and indigestion as compared to lack of appetite, gas/flatulence and pain in joints in the older depressed males aged(above 70 years)

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Yale in (2001) evaluated a group of 754 individuals aged 70 and older from year 1998 to 2005. Participants were asked to provide demographic information, take cognitive tests and report any medical conditions at the start of the study and at follow-up assessments conducted every 18 months. On screening for depression participants showed symptoms such as lack of appetite, feeling sad or sleep problems exhibited during the previous week. During the study, 35.7 percent of the participants were depressed at some point. Of those, 17.8 percent remained depressed during two consecutive time points, 11.2 percent at three time points, 6.3 percent at four points and 4.5 percent at all five time points. More men than women were depressed at each 18-month follow-up and women were more likely than men to experience depression at subsequent time points. Women had a higher likelihood of transitioning from non-depressed to depressed, and a lower likelihood of transitioning from depressed to non-depressed or death (Justin D, 2008). Many differences have also been reported between men and women in the nature of depressive symptoms, course of illness and response to treatment.

Many factors unique to women are suspected to play a role in developing depression. Reported research is focused on understanding these factors, including: reproductive, hormonal, malnutrition, genetic or other biological factors; abuse and oppression; interpersonal factors; and certain psychological and personality characteristics. But, the specific causes of depression in women remain unclear.

With the onset of puberty, women begin suffering far more than boys, which carries over into adulthood and peaks at perimenopause, the transition into menopause. Thereafter, the numbers gradually recede back to the levels of men.

Hay in 1994 carried out a 6-month study in Edinburg. A total of 95 women were interviewed of which 78 were in perimenopausal stage. Among the 78 women 63% suffered from depressive disorder at some time in their life and 37% of all episodes occurred within the period of perimenopause. Among the 20 depressed patients between 40-50 years of age studied recently at Vadodara in 2004, 10% had severe depression, 60% had moderate

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depression and 30 % had mild depression according to the Beck's Depression Inventory(Mallya, 2004).

A study on interaction of genetic factors with stressful life events found that genetic factors influence the risk of onset of major depression in part by altering the sensitivity of individuals to the depression including effect of stressful life event. (Kendler et al, 1995)

Studies suggest that older adults have lower rates of depression than other age groups, and there may be a narrowing of the gender gap in old age. Nevertheless, an estimated 10 to 20 percent of older women experience clinically significant depressive symptoms. The most important risk factor for depression in older women appears to be physical health problems, including pain, functional limitations, and side effects of medications. Structural brain changes, vascular risk factors, and cognitive impairment are sometimes referred to as vascular depression, which may be more resistant to antidepressant treatment or ECT and may have a more chronic course than other forms of depression. Late onset depression may also be a precursor to dementia.(Mac man 2008)

Women with certain characteristics—including pessimistic thinking, low self-esteem, a sense of having little control over life events, and a tendency to worry a lot—are more likely to develop depression. These characteristics can increase the effect of stressful events or limit a woman's ability to cope with them.

Gender and marital status within the cultural context are also found to be related to depression.

Walker et al (1991) studied the relationship of loneliness, social isolation and physical health to dietary adequacy of independently living elderly. The total of 61 subjects between 60-94 years were studied and results showed inadequacy.

Research continues to explore how mental health affects women. Data available on impact of depression on overall health of older women is very scarce. At the same time, it is important for women to increase their awareness of what is already known about depression, Present study was planned therefore with a view to explore mental and physical health profile of older women with special reference to depression. Further, interventional studies were also planned to explore the role of nutrition and herbal medicine in older depressed women.

Depression leading to malnutrition or vice a versa is a vicious cycle that can only be broken through proper nutrition care and intervention studies, which can be developed to reduce frequency and aggravation. . Tolmunen& Associates (2003) reported association between dietary folate, cynocobalamine, pyridoxine and riboflavin. It was found that lower folate intake was significantly associated with depression. As mentioned earlier there are several environmental factors for causing depression therefore there is an urgent need for the treatment. With this aim the present study also made an attempt to develop interventional studies to explore the role of nutrition and herbal medicine in older depressed women.

The research looking into the role of folic acid and depression is still quite new. Folic acid deficiency is one of the most common nutrient deficiencies in the world. Folic acid is important for functioning of the nervous system at all ages. Depression is common in patients with folate deficiency, and sub acute combined degeneration with peripheral neuropathy is more frequent in those with vitamin B-12 deficiency. In a survey of nutritional status and cognitive functioning in 260 healthy elderly subjects aged 60 to 94 years in the community, there was a significant relation between impaired abstract thinking ability and memory and lower levels of folate intake & serum (Goodwin JS, 1993).

Treatment of 26 folate deficient epileptic patients with 5 mg of folic acid daily for one to three years resulted in improved drive, initiative, alertness, concentration, mood, and sociability in most (Reynolds,1999). Botez et al (2004) carried out a study on 20 patients aged 60yrs; the results showed 16

patients whose impaired intellectual function, confirmed on neuropsychological testing, was strikingly improved after six to twelve months of folic acid therapy.

Godfrey et al (2000) added 15 mg of methylfolate to standard psychotropic medication and reported significant and increasing clinical and social recovery of folate deficient depressed and schizophrenic groups over six months.

Ross (2002) stated from his study that out of 50 subjects, 31-35% of depressed patients had been found to be deficient in folic acid. Some depressed persons non-responsive to anti-depressant medications became responsive with the addition of folic acid. The doses of folic acid used in the studies for treating depression were very high, ranging from 15-50 mg, which is 15,000-50,000 micrograms.

Undertaking large scale community based studies of folate supplementation to explore the preventive potential of the vitamin for mood and cognitive disorders. Such studies are being designed or undertaken for the possible prophylaxis of vascular disease and could be adapted to address the question of preventing or reducing depression and dementia, including vascular dementia, while taking into account the special requirements of the nervous system. In present study effect of folic acid supplementation was assessed in terms of depression and mental health.

The brain produces potent chemicals called the neurotransmitters, which are made of nutrients from food. The two major neurotransmitters involved in preventing depression are serotonin and non-epinephrine. Vitamin B_6 is needed for the synthesis of neurotransmitters such as serotonin and dopamine (Williams and Wilkins. 2000). These neurotransmitters are required for normal nerve cell communication. Researchers have been investigating the relationship between vitamin B_6 status and a wide variety of neurological conditions such as seizures, chronic pain, depression, headache, and Parkinson's disease (Bernstein AL, 1990).

Because of the complex relationship between depression, serious physical illnesses and drug interaction in the older persons, an accurate diagnosis in this group is important. The symptoms of depression in older persons are also often ignored or confused with other common ailments. At times even when depression is diagnosed, older persons may be reluctant to take treatment, thereby delaying the treatment.

Women, a group that is already disadvantaged in many ways face additional challenges, in old age reinforcing etiology of depression. Thus, there is an urgent need to understand the dynamics of depression especially in older women and design suitable interventions. With this view it was thought worthwhile to supplement folic acid for eight weeks and evaluate its impact on their mental health and level of depression.

Herbal intervention belonging to ayurveda is the most ancient medical system and is most widely acceptable to people. Some of these herbs, which are, indicated as additional supplementation for prevention of mental health problems, which are Brahmi, Ginkgo biloba, ashwagandha, ginseng etc.

Brahmi(*Bacopamonniera*)is one of the common Ayurvedic herbs known as a brain tonic, which is clinically proved and documented. Bacoside A which assists in release of nitric oxide that allows the relaxation of the aorta, to allow the blood to flow more freely through the body and Bacoside B which is a protein valued for nourishing the brain cells; as a result it improves mental clarity, confidence, intelligence and memory recall. Brahmi contains saponins, which have been shown to strengthen the nervous system and decrease insomnia.

Bacopa assists in **heightening mental acuity** and support the physiological processes involved in relaxation. Bacopa is considered as the main **rejuvenating herb for nerve and brain cells** and, therefore, plays important role in Ayurvedic therapies for the treatment of **cognitive disorders of aging**.

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Under the definition of herbal drugs in the Guidelines of Herbal Medicines issued by the World Health Organization (WHO) in 1991, a herbal product that has been used traditionally without demonstrable harm does not require specific regulatory action unless new evidence demands a revised risk/benefit analysis. Subsequently, several formulations containing *Bacopamonniera* extracts standardized for bacosides content have appeared in the global marketplace.

In 1993, when the Central Drug Research of India (CDRI) began extensive research of their rich herbal treasures to source active ingredients for modern therapeutic uses, they started clinical trials with brahmi on human volunteers. No adverse effects were recorded. The CDRI presented their research findings to numerous international brain research conferences.

An intervention study was tested on men with mild to moderate mental deficiency with Brahmi dosage of 500 mg of extract thrice a day for one year. At the end of study, there was improvement in concentration ability, memory span, and overall mental performance in individuals taking the extract as compared with placebo group (Rush AJ. 2007).

In human studies, Brahmi has been shown to improve many of the higher order cognitive processes, including the ability to significantly improve speed of visual information processing, learning rate, memory consolidation, improve memory retention, enhance retention of new information, and decrease the rate of forgetting of newly acquired information (Ahujja, 2006)

A double-blind, placebo-controlled randomized study was conducted to test the efficacy of standardized *Bacopamonniera* extract (SBME) in subjects with age-associated memory impairment (AAMI). A total of 86 subjects above 55 years of age with complaints of memory impairment were enrolled. The subjects received either 125 mg of SBME or placebo twice a day for a period of 12 weeks followed by a placebo period of another 4 weeks (total duration of the trial 16 weeks). The results of the study observed a significant improvement in the logical memory subtest total score at 4 weeks, and a

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significant improvement in the mental control, logical memory subtest and paired associate learning score at 8 weeks. Further, at 12 weeks, besides mental control, logical memory and paired associate learning and total score, the digit forward subtest score also showed a significant improvement with SBME intervention. Thus *Bacopamonniera* was proved to be efficacious in subjects with age-associated memory impairment (Asthana et al, 2006).

Central Drug Research India (2003) investigated the standardized methanolic extract of Bacopamonniera (bacoside A) for potential antidepressant activity in rodent models of depression. The effect was compared with the standard antidepressant drug imipramine (15 mg/kg). The extract when given in the dose of 20 and 40 mg/kg, orally once daily for 5 days, it was found to have significant antidepressant activity in forced swim and learned helplessness models of depression and was comparable to that of imipramine drug.

A double-blind, placebo-controlled animal studies indicated that the Brahmi herb works by activating the memory section of the brain, allowing it to perform better.Clinical studies in published literature report the beneficial role of Bacopamonniera in mental health, for example in anxiety neurosis, in impaired mental functioning, in revitalizing intellectual functions in children, in improving cognitive functions in stroke victims, in children suffering from ADHD (Attention Deficit Hyperactivity Disorder) and in convulsive disorders (Praduman, 2008)

In a study seventy-six adults aged between 40 and 65 years took part in a double-blind randomized, placebo control study in which various memory functions were tested and levels of anxiety measured. There were three testing sessions: one prior to the trial, one after three months of the trial, and one six weeks after the completion of the trial. The results showed a significant effect of the Brahmi on a test for the retention of new information. Follow-up tests showed that the rate of learning was unaffected, suggesting that Brahmi decreases the rate of forgetting of newly acquired information. Tasks assessing attention, verbal and visual short-term memory and the retrieval of pre-experimental knowledge were unaffected. Questionnaire

measuring daily memory function and anxiety levels were also unaffected (Dianne Booth, 2002).

The leaves of bacopa contain saponins, including the bacosides,which are thought responsible for the therapeutic properties of the herb (Rastorgi RP, 1983). In animal studies, both purified bacosides and extracts of bacopa standardized for bacosides have been found to enhance several aspects of mental function and learning ability.Additional brain effects of bacopa demonstrated in animal research include reduction of both anxiety and depression (Bhattacharya SK, 2003).Biochemically, these nervous-system effects have been attributed to an enhancement of the effects of neurotransmitters acetylcholine and possibly, serotonin or GABA (gamma aminobutyric acid) (Dey PK, 1999).

In summary, Brahmi can help support and improve all aspects of mental function, including comprehension, memory and ready recall, by enhancing the crucial co-ordination of these three aspects of mental function. Therefore, intervention of Brahmi for 12 weeks in depressed older women proved as beneficial part of the present study.

In the light of the relevant literature the study focused on evaluation of health and nutritional status in adult and older women with depression and carry out appropriate interventions to combat depression in women. The specific objectives of the study are mentioned below:

The specific objectives of the studies were

1. To identify and study depressed women aged more than 40 years from free living population belonging to all the three income groups with respect to their socio demographic profile.
2. To study diet related aspects and dietary intake of adult and older women with depression.
3. To assess mental & physical health profile and nutritional status of adult and older women with depression.
4. To collect data on morbidity profile of adult and older women with depression.
5. To study psychosocial profile of adult and older women with depression.
6. To carry out intervention studies with the use of
   A. Folic acid supplementation for a period of eight weeks and study the post intervention effect of the supplementation on older women with depression
   B. Brahmi supplementation for a period of twelve weeks and study the post intervention effect of the supplementation on elderly women with depression

Based on the above objectives the relevant literature reviewed is presented in the next chapter.

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