COMPARISON OF SLEEP PATTERNS IN A GROUP OF YOUNG AND ELDERLY INDIVIDUALS DURING THE COVID-19 PANDEMIC

MERVE EVYAPAN AKALIN

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ABSTRACT

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Evyapan Akalın, Merve

Master's Program in Experimental Psychology

Advisor: Prof. Dr. Canan BAŞAR EROĞLU

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In this study, it was aimed to compare the sleep patterns of a group of young and elderly individuals during the COVID-19 pandemic. A questionnaire was prepared to determine the sleep problems of individuals. The questionnaire data collected from 244 participants were analyzed by using SPSS version 21. The findings showed that there was a significant effect of age groups on sleeplessness. Sleeplessness scores were significantly higher in the 60+ group than in the 18-40 group while there were no significant differences between age groups on sleep quality.

Keywords: sleep quality, sleeplessness, age, COVID-19

ÖZET

COVID-19 PANDEMİ DÖNEMİNDE GENÇ VE İLERİ YAŞ GRUP BİREYLERİN UYKU DÜZENLERİNİN KARŞILAŞTIRILMASI

Evyapan Akalın, Merve

Deneysel Psikoloji Yüksek Lisans Programı

Tez Danışmanı: Prof. Dr. Canan BAŞAR EROĞLU

Ağustos, 2021

Bu çalışmada, Covid-19 salgını döneminde, genç ve ileri yaş grubundaki bireylerin, uyku düzenlerinin karşılaştırılması amaçlandı. Bireylerin uyku problemlerini belirlemek için bir anket hazırlandı. 244 katılımcıdan toplanan anket verileri SPSS 21 kullanılarak analiz edildi. Bulgular, yaş gruplarının uykusuzluk üzerinde anlamlı bir etkisinin olduğunu göstermiştir. Uykusuzluk skorları 60+ yaş grubunda, 18-40 grubuna göre anlamlı olarak daha yüksekti, yaş grupları arasında uyku kalitesi bakımından anlamlı bir farklılık yoktu.

Anahtar Kelimeler: uyku kalitesi, uykusuzluk, yaş, COVID-19

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

1.1 Definition of Sleep

Sleep is a mental and physical state in which the nervous system is inactive and the eyes are closed, the posture and muscles are relaxed, and consciousness is almost stopped (Matsumoto, 2009).

Sleep constitutes approximately one third of the human life span and consists of 5 different periods. One of these periods is called REM (Rapid Eye Movement) and the others are called Non-REM (NREM). If a definition is made to include these periods; It can be said that sleep is the periodic transitions between wakefulness and five sleep periods. These periods were determined by evaluating brain electrical activity, changes in muscle tone and eye movements measured by polysomnography. (Hobson, 1990).

Sleep is characterized by a cyclical succession of NREM and REM sleep for an adult. The average period of this cycle is usually 90 minutes. However, the length of the individual cycles varies considerably overnight. The flawless functioning of all sleep stages one after the other during the night is referred to as "sleep architecture". Sleep consists of cycles, each phase of which usually takes 90-120 minutes in total, repetitive but slightly changes can be observed in the contents. The sleep architecture which can show individual differences is completed in about 8 hours in a healthy person. Internal and external stimuli, hormones, pathways and personal experiences play an important role in the architecture that designs this perfect physiology (Fuller, Gooley and Saper, 2006). In this architecture, if a person wakes up with external stimulation, he experiences inertia, insomnia, confusion, daytime sleepiness, and poor performance. In the face of cortical stimulation, even in any sleep cycle, the person performs a waking process to respond to the threatening stimulus (such as sudden awakenings, jumping awakening). These situations often occur more in waking up from sleep, which has a slow wave feature and interruption of sleep causes daytime sleepiness and performance losses. In short, a balanced harmony of internal and external factors is essential to ensure subjective and objective quality of sleep and to maintain healthy daytime functionality in sleep architecture (Feinsilver and Hernandez, 2017).

1.2 Sleep Physiology

Basically, sleep has two phases. One of these; Rapid eye movement (REM) is the phase in which rapid eye movements are experienced, the other is the phase where there is no rapid eye movement (NREM). NREM phase consists of 4 phases. Stage 1, the first part of sleep is the period between sleep and wakefulness; Stage 2 which sleep spindles and k complexes are observed while stage 3 and 4 are the delta activity period known as deep sleep (Siegel, 1990).

1.2.1 Non - Rapid Eye Movements Period (NREM Sleep)

1.2.1.1 Stage 1

It is the stage of transition from wakefulness to sleep, and it is the preparation period for the transition to the other 3 stages. In the first stage, sleep is very light, and it seems possible to wake up immediately. It is a period of light sleepiness and sleepiness. Theta brain waves occur at this stage. Eye movement slows down and muscle mobility decreases, also breathing is slow but regular and heart rate slows down at this stage (Umay et al., 2021).

1.2.1.2 Stage 2

It's one of the most intricate aspects of sleeping. The movement of the eyes is slower than it was in the first stage. Within the brain, theta waves continue to spread. At this point, the person who is being sought to wake up is unaware that he or she is sleeping and claims that he or she is not. It accounts for 45 to 55 percent of total sleep time. Muscle mobility has been reduced marginally (Hirshkowitz, 2004).

1.2.1.3 Stage 3

It is the portion of total sleep known as delta sleep or slow wave sleep. The deepest sleep occurs during this stage. Muscle mobility has been significantly diminished. Delta waves begin to spread instead of theta waves. It is possible to see slow eye movements. It accounts for 20-25 percent of total sleep time. The lightest and most common waves are delta waves (Keenan and Hirshkowitz, 2011).

1.2.1.4 Stage 4

Stage 3 and 4 are similar and both involved in the slow wave sleep category. Stage 4 constitutes more than 50% of total sleep. At this stage, it was discovered that the brain's delta waves were spreading faster and it is very difficult to wake up the sleeper because sleep is very deep (Hirshkowitz, 2004).

1.2.2 Rapid-Eye Movements Period (REM Sleep)

During this phase, homeostatic periods including breathing and body temperature, slow down. The rapid eye movements named after REM sleep are the result of the brain trying to scan for events in the imaginary world. In other words, it is the part where the sleeper is noticed to move left and right under the eyelids during a dream. These eye movements during REM sleep cannot be distinguished from eye movements that occur during wakefulness. There is binocularly synchronicity observed in both cases. In other words, it is characterized by the movement of both eyes together. During REM sleep, there is a lack of eye focus and fixation which are essential for wakefulness and very rapid mental activity is an important feature. Another feature of REM sleep is that it is a period when body functions can give partial response to external stimuli (Vitiello, 1997).

REM sleep attracts attention as a quite different period. The increase in cognitive and physiological activities during REM is noteworthy. It is known that 80 % of dreams occur during REM. Studies of blood flow in the brain during REM suggest that blood flow and oxygen use increase similarly to wakefulness. During REM sleep, blood flow increases in the brainstem, anterior cingulate, thalamus, hypothalamus, amygdala, and basal ganglia (Jasper and Tessier, 1971).

In REM, the electroencephalogram (EEG) changes suddenly and shows the characteristic in the first period of wakefulness. Therefore, brain activity is high in this stage of sleep. REM is often associated with dreams and dreaming is also a mental activity. Dreams are also seen in slow wave sleep. However, there is a difference between dreams in slow wave sleep and dreams seen in REM. Dreams in REM are remembered in the post-sleep period, while dreams in slow wave sleep are much more difficult to remember. In other words, dreams in slow wave sleep have little or no permanent memory record. Dreams seen in slow wave sleep cannot settle into any memory system enough to be remembered in the post-sleep period (Anch et al., 1988). In studies during periods when people shorten their sleep time, it is noteworthy that the duration of the 1st, 2nd and 3rd periods of sleep is reduced, slow wave and REM sleep time is preserved as much as possible. It was found that when the REM period was eliminated, people spend more time in REM periods to fill deficiency in their next night's sleep. This is called the "rebound phenomenon". In other words, in a sense, the organism is trying to fill the sleep gap. This suggests that REM is an almost vital need (Jasper and Tessier, 1971).

1.3 Electroencephalography (EEG)

The process of recording spontaneous changes in electrical potentials that occur during brain activity, while it is stimulated by continuous rhythmic electrical potentials and activation methods, is called EEG (Electroencephalography). Different brain waves occur during each sleep period. EEG may be used to visualize these changes in brain wave activity, which are distinguishable from one another by the frequency and amplitude of the brain waves (Stratton, 2013).

EEG activity can be defined as alpha, beta, theta, and delta waves. The amplitude of the waves increases as you progress from light to deep sleep, while the frequency drops. In the REM phase, a low-amplitude and mixed-frequency EEG activity is similar to the wakefulness phase is observed Table 1 shows the EEG wave types, their features and the sleep stages in which they are observed while Table 2 shows specific EEG patterns and their features. The characteristics of the waves observed in different stages of sleep are shown in Figure 1.

Table 1. EEG wave types (Source: Unsay Metan et al., 2013)

Wave type	Feature	Appearing Stage
Beta	13-30 Hz	Awake, active person
Alpha	8-13 Hz	Eyes closed, calm alertness
Theta	3-7 Hz	Stage 1
Delta	1-3 Hz	NREM Stages 3 and 4

modified

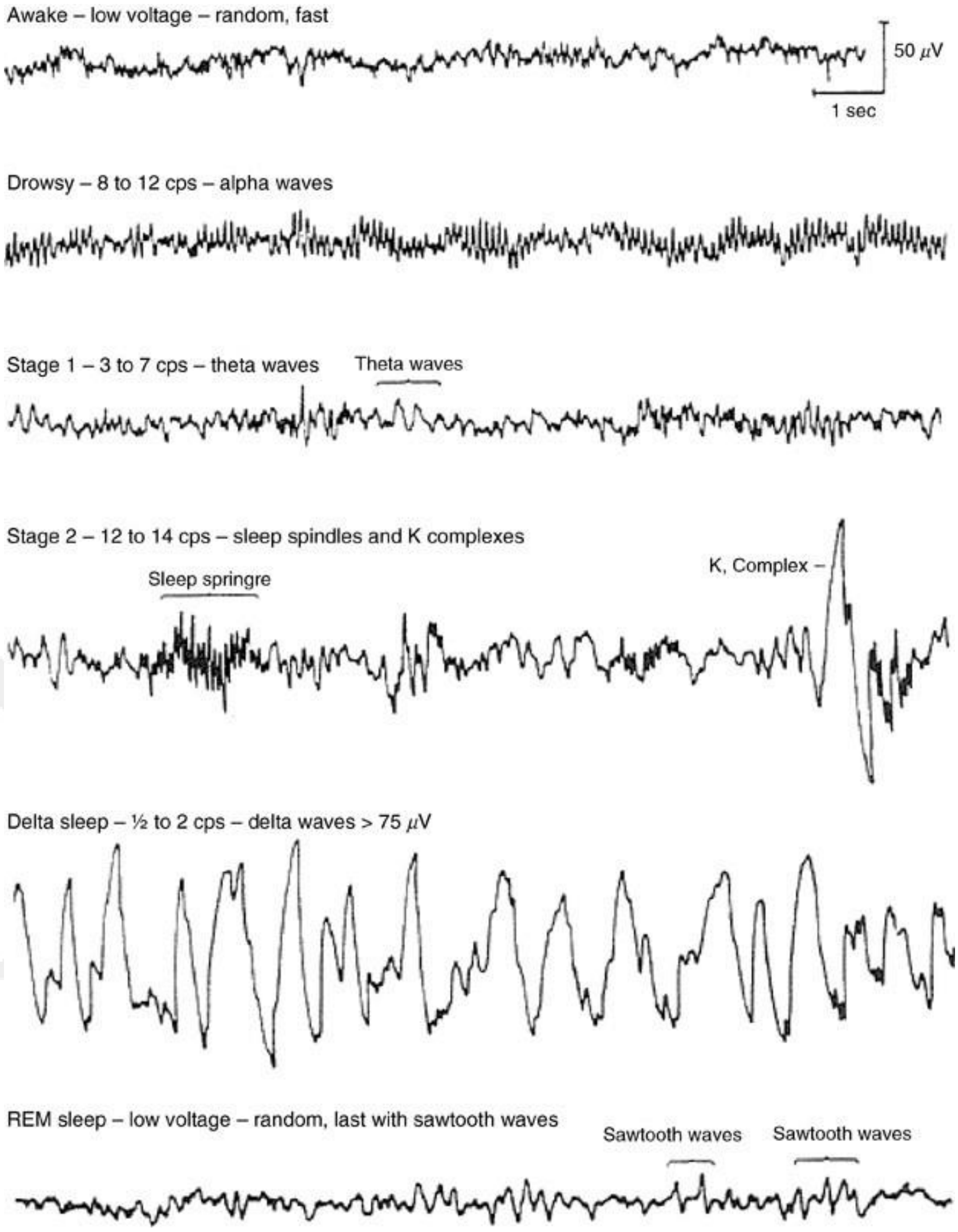

Figure 1. EEG wave pattern of different sleep stages (Source: Stratton, 2013)

Table 2. Specific EEG patterns (Source: Unsay Metan et al., 2013)

EEG Pattern	Feature	Appearing Stage
Sleep spindles	12-14 Hz, >0.5 sec.	NREM stage 2
K complexes	Sharp negative, slower positive, >0.5 sec.	NREM stage 2
Vertex sharp waves	Sharp negative with deflection	NREM stage 1

modified

1.4 Regulation of Sleep

Autonomic nervous system balance, homeostatic sleep continuity, and circadian rhythm are the three basic mechanisms that coordinate sleep and wakefulness. These are independent from each other also they play important role in maintaining sleep and wakefulness with a dynamic balance (Hirshkowitz and Sharafkhaneh, 2005).

1.4.1 Homeostatic Sleep Regulation

The organism has internal balance mechanisms that determine the balance between time spent asleep and time spent awake. This balance is provided with the help of hormonal secretions. Hormones such as cortisol, catecholamine, thyroid stimulating hormone and melatonin are the main hormones that play a major role in the maintenance of this homeostatic balance. The decrease in the amount or activity of these hormones affects the sleep physiology of the person, whether due to physiological (such as aging) or pathological reasons. As a result of these conditions, which manifest as symptoms, clinical signs such as distraction, loss of performance, decrease in cognitive abilities, and restlessness occur in the person. In addition, factors such as caffeine, alcohol use and stress also affect the hormonal compensatory system, which plays a role in the establishment of this internal balance (Foley et al., 1995).

1.4.2 Autonomic Nervous System Balance

Sleep makes a balanced decrease in sympathetic activity physiologically, while it increases parasympathetic activity. Endogenous factors such as stress hormones, anxiety and exogenous factors such as nicotine, alcohol, caffeine affect the sleep by affecting autonomic nervous system negatively (Foley et al., 1995).

As a stress hormone, cortisol has a special place in the autonomic nervous system. The release of cortisol within normal physiological limits is the strongest stress response to environmental threats that humanity have been exposed to since ancient times. However, high levels of cortisol cause shortened slow-wave sleep in the sleep cycle.

1.4.3 Circadian Rhythm

Circadian rhythm is defined as the repetition of the biochemical, physiological, and behavioral rhythms created on all creatures by the rotation of the earth around its own axis for 24 hours in one day. It refers to the changes in physiological and biological processes of the organism for about a day. In humans, the most fundamental and determining factor in the sleep-wake cycle is the circadian rhythm (Zee and Manthena, 2007).

The main center that regulates the circadian rhythm is the suprachiasmatic nucleus (SCN) located in the anterior part of hypothalamus. SCN is responsible for controlling body core temperature rhythm, sleep-wake cycle, and secretion of some hormones such as growth hormone, cortisol, and melatonin. This system assures that the organism's physiological activities are in sync with the external environment and that rhythmic functions are maintained in different conditions. Light is the most important rhythm regulator. The light and dark cycle in the external environment is important in regulating the circadian rhythm. Melatonin synthesis and release are stimulated by darkness at night and repressed by light during the day. However, melatonin levels are reduced when exposed to light at night (Zhu and Zee, 2012). In addition to light, melatonin, temperature, jet lag and shift changes are among the factors affecting rhythm. As a result of these effects, individual differences may arise in terms of sleeping habits. These differences can also determine lifestyle of a person. In career choices that require shift work and intercontinental air travel, the circadian rhythm in personal sleep architecture becomes important. This situation can lead to human profiles such as "morning-type person" or "evening-type person" in social life. Morning types are people who go to bed early in the evening and wake up early in the morning and have high physical and cognitive performances during the day while evening types are those who go to bed late, get up hard in the mornings and whose performance rises in the evening (Vink et al., 2001).

1.5 Function of Sleep

Sleep is a complex, highly organized process that is affected by many internal and external factors, in which the brain is as active as wakefulness in certain periods and features a reversible unconsciousness and selective unresponsiveness. Hypotheses regarding the function of sleep include energy conservation, brain detoxification, brain thermoregulation, tissue regeneration, learning and memory formation. After the discovery of REM sleep, important studies have been conducted showing a relationship between REM sleep and learning and memory consolidation. Although it has effects on the whole body, sleep is a function of the brain (Öztürk, 2007). The human body goes through three physiological periods during the day: Wakefulness, Non-REM sleep, and REM sleep. Each of these three periods contains different physiological characteristics (Wiggs, 2001).

1.5.1 Learning and Memory

Many studies have shown the importance of sleep for learning and memory. It is known that sleep plays a role in transferring the experiences gained during the day to memory. Researchers have shown that sleep not only fixes memory records, but also prevents them from deteriorating over time and increases them. It was concluded that different types of memory are strengthened in different sleep periods. Both of pre-learning sleep and post-learning sleep takes place seems critical. It is known that sleep plays an important role in two different stages in relation to memory. The first is the stage of coding the pre-learning information; The second is the consolidation phase, which is related to the permanence of new information after learning has occurred. There is strong evidence that sleep plays a role in the consolidation of newly acquired knowledge (Walker and Stickgold, 2006). Consolidation of memory includes a series of processes including strengthening and stabilizing newly acquired and non-permanent memory traces, and their integration with long-term memory (Stickgold and Walker, 2007). Physiological and behavioral studies show that the process of consolidation of memory representations occurs mostly during sleep at night. In addition, studies have shown that better recall occurs when a person sleeps after learning new information related to explicit memory and when the person has an efficient sleep period in terms of slow-wave sleep (Plihal and Born, 1997).

Different sleep processes have different effects on memory processes. NREM sleep provides the development of declarative (explicit) memory while REM enables the development of motor and implicit memory (Ertuğrul and Rezaki, 2004).

1.5.2 Restoration of Tissues and Growth

Growth hormone is a tiny protein molecule that is also known as somatotropin or somatotropic hormone. It induces the growth of almost all tissues in the body that have the ability to grow. It increases the size of the cells. It provides special distinction of certain types of cells, such as bone growth cells and progenitor muscle cells. In addition to the general effect of growth hormone, which causes growth, it also increases body protein, ensures the use of fat stores and the preservation of carbohydrates. It strengthens the bones and supports the immune system. Growth hormone is secreted during the deep sleep phase. In normal healthy individuals, the period when GH hormone secretion is most experienced is the first period of stage 3 sleep. A normal sleep starts with light sleep and goes into deep sleep-in cycles. These cycles occur approximately 4 times in a 7–8 hours sleep period, that is, the sleep phase in which growth hormone will be secreted 4 times is passed. If the duration of sleep is limited and less sleep is given, the number of cycles and the amount of growth hormone secretion decrease (Takahashi, Kipnis and Daughaday, 1968).

1.5.3 Conservation of Energy

In mammals and birds, which are endothermic creatures with high metabolic rates, mechanisms that provide energy saving by minimizing heat loss are highly developed and are extremely important for the continuation of life. According to Allison and van Twyver, sleep developed in mammals and birds along with endotherm. During sleep, the thermostat is turned off and the high energy cost of endotherm is balanced. After sleep begins, body temperature and metabolic rate begin to decrease. There are basically two reasons for this decrease. The first reason is increased sweating (Geschickter, Andrews and Bullard, 1966). The other reason is the hypothalamus's set point for body temperature regulatory mechanisms is being lowered (Glotzbach and Heller, 1976).

For most living species, in thermoneutral environmental conditions, a decrease of 1–2°C in body temperature and a decrease of approximately 10% in general metabolic rate are observed compared to sleep and wakefulness. The decrease in metabolic rate in humans is around 25%. These energy conservation levels, which are thought to be related to sleep and thought to be caused by sleep, become even more pronounced when the environmental temperature decreases. For example, it has been shown that the metabolic rate reduction caused by sleep in a naked person at 21°C is around 40% (Berger and Phillips, 1995).

1.5.4 Immune Defense

It has been widely observed that people who are sleep deprived get sick more easily. On the other hand, they recover more quickly as they give importance to sleep and rest. According to studies examining changes in the immune system during sleep deprivation or during sleep itself, anterior hypothalamus lesions cause insomnia and posterior hypothalamus lesions cause hypersomnia. In addition, many researchers have detected immunosuppression in lesion studies in the hypothalamus. It is known that there is a two-way communication and interaction between the immune system, endocrine system and nervous system. Different results have been reported on the effects of complete or partial sleep deprivation on the immune system. Some studies showing that some immune parameters are suppressed, some are not changed or some are activated (Everson, 2005). As a result of all these studies, it is seen that a healthy sleep is necessary for the effective functioning of the immune system.

1.6 Physiological Changes in Sleep with Age

The sleep-wake cycle varies with age. Total sleep time decreases with increasing of age. During the first few decades of life, REM sleep decreases dramatically, more than 50% of total sleep time at birth and 20-25% more than in adolescence. Slow sleep time also decreases with increasing of age, and slow-wave sleep may disappear completely in very elderly individuals. It is known that the frequency of wakefulness increases in the elderly. It is difficult for the elderly to fall asleep after waking up. This is accompanied by an increase in night wakefulness during the night. In the elderly, wakefulness is an expression of sleep organization disorder because of changes in circadian and homeostatic regulation. A decrease in mental and physical activity related to age also affects homeostatic regulation (Roehrs, 2000).

During the aging process, the most important role in sleep physiology is on the circadian rhythm. Hormones that decrease in the body with aging, decrease in body activities or pathological conditions negatively affect the circadian rhythm. Cortisol, melatonin, thyroid stimulating hormone can be physiologically affected by aging. All these effects can disrupt the sleep cycle of the elderly individuals. At the old age, this situation reverses, and it is seen that both NREM and REM phases decrease. In fact, at the age of 85 and above, the NREM phase can disappear completely. Frequent waking increase, it becomes difficult to sleep again and social, psychological, and organic ailments also increase. Studies have shown that the rate of sickness increases in the elderly who spend 2% of their total sleep awake during the night (Neikrug and Ancoli-Israel, 2013). The total amount of daily REM and NREM sleep, which changes with age are shown in Figure 2. The amount of REM sleep has decreased significantly over the years and NREM has decreased less rapidly (Stratton, 2013).

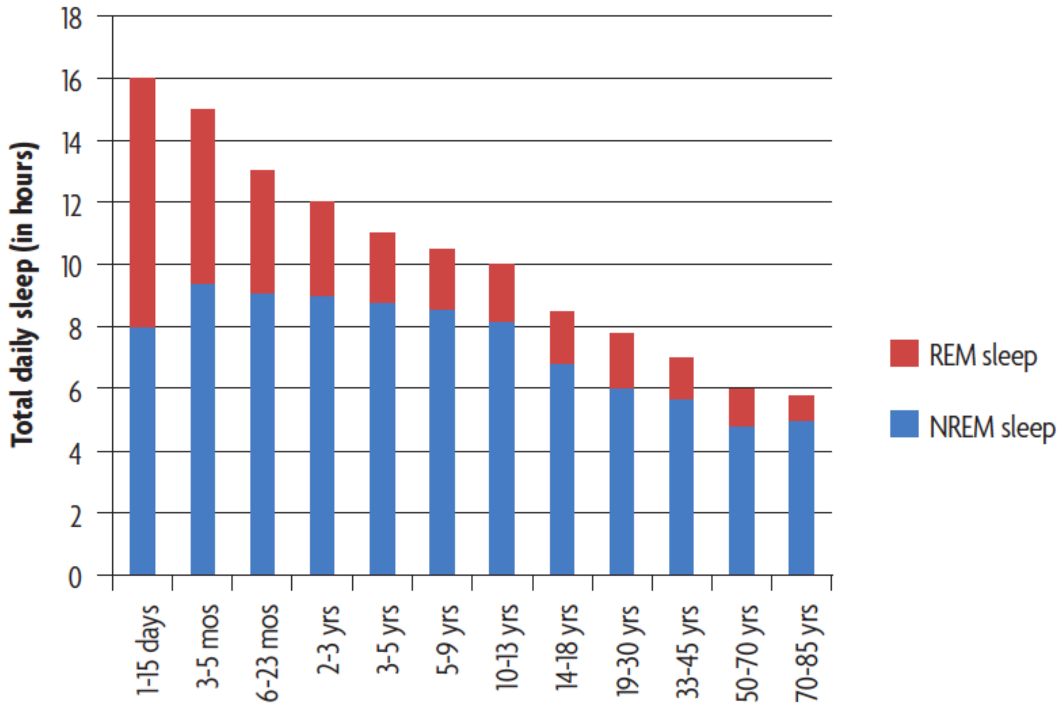

Figure 2. Patterns of Human Sleep over a Lifetime (Source: Stratton, 2013)

1.6.1 Light and Sleep

Light, especially bright light is important to maintaining physical and psychological well-being in the daily life cycle of the elderly, also it is important in the continuation of sleep balance. It was mentioned that the exposure to natural bright light outside is 10 minutes in total and this number is seriously low, especially in institutional elderly nursing homes and retirement homes (Campbell et al., 1988). It has been determined that bright light affects the pineal gland in the brain during the day, the supraoptic nucleus is affected and the sleep state is shortened during the day, which reflects positively on night sleep. Simple measures to be taken in this regard will be able to establish sleep balance at night by providing sleep rehabilitation. Also, a reasonable amount of exposure to daylight; It is an important factor in establishing sleep hygiene again (Neikrug and Ancoli-Israel, 2013).

1.6.2 Circadian Rhythm and Elderly

The importance of physiological effects of indoor and outdoor factors on circadian rhythm is known. If the circadian rhythm is disrupted in the elderly, the period of relaxing, quality of sleep with deep slow wave sleep decreases significantly. Circadian rhythm mechanism occurs like that of adults. The same internal and external factors play a role. The efficiency and amounts of melatonin, cortisol, and thyroid hormone have decreased in the elderly. As a result, sleeping and waking up earlier than expected, shortening of sleep time at night and not being able to fall back to sleep problems arises and the need for antidepressant and hypnotic drugs increases. This means that morbidity and mortality increase gradually (Neikrug and Ancoli-Israel, 2013)

1.6.3 Melatonin and Sleep Relationship

Melatonin hormone has been discovered as an important physiological sleep regulator. Sleepiness usually begins 2 hours after the start of endogenous melatonin production at night (Cajochen, Kräuchi and Wirz-Justice, 2003). Sleep regulating mechanisms are activated by interacting with the increase in melatonin level and neural activity. The initiation and termination of sleep regulates sleep homeostasis by interacting with mutual inhibition. In addition, it has been elucidated how the release of melatonin, which contributes to the biological clock in addition to the sleep-wake balance, is affected by light and dark. This effect is closely related to the stimulation of the suprachiasmatic nucleus by light and darkness (Saper, Scammell and Lu, 2005).

1.6.4 Control of Melatonin Secretion

Light stimulus is mainly transmitted to the SCN via the retina-hypothalamic pathway (RHT) and affects the activity of the circadian oscillator for a full 24 hours. The SCN distributes circadian information via neuronal efferent pathways to different brain regions. After the paraventricular nucleus (PVT) is affected, melatonin release is activated by the environmental light stimulus. The SCN can use the melatonin rhythm generated to send rhythmic information. It ultimately contributes to the sleep-wake cascade by contributing to the circadian rhythm (Astiz, Heyde and Oster, 2019).

1.7 Sleep Deprivation Experiments

Although it has effects on the whole body, sleep is essentially a function of the brain. Sleep deprivation has been shown to negatively affect cognitive processing system (Smith, 1996). On the other hand, sleep deprivation studies has shown that the time of deprivation and the sleep phase at which it is performed gain importance because the effects of deprivation at different times and different sleep periods on cognitive processing system are also different (Dotto, 1996).

It is known that physical and cognitive depression occurs when there is not enough sleep. In animal experiments, unexplained deaths occur after 6 to 7 weeks in total sleep deprivation. During the withdrawal process, activation begins in the adrenergic system first, and arousal occurs in the psychomotor area. In this period, despite sufficient food intake, weight loss occurs, the balance of the system is disrupted, and the animal dies. It has been shown that the animal quickly returns to normal when sleep deprivation is terminated during the experiment (Rechtschaffen et al., 1989).

In a study by Rudoy et al., the participants were taught the sounds and locations of the objects. Later, during NREM sleep, the sounds of a certain number of objects were played back without giving information. Participants placed objects to which they listened to their voices during sleep more successfully than those who were not listened to. With this study, researchers have shown that sounds played during sleep help recall and reinforce (Rudoy et al., 2009).

In another study, brain electrical activity of sleeping rats was measured after a new maze experience. As a result of the measurements, it was reported that rats, which were thought to show "re-running" activity during sleep, learned the maze better than those who did not show running again the next day and consolidated this information during sleep (Ji and Wilson, 2007).

Lack of sleep has been shown to have negative effects such as difficulty in remembering, increased perception threshold, and distraction. In a fMRI study, in which a verbal learning experiment was performed, after sleep deprivation was performed, it was observed that the group with sleep deprivation had less activation in learning-related areas (MTL) than the other sleeper group (Drummond et al., 2000).

In “sleep deprivation” studies, in which participants were not allowed to sleep after the learning task, it was observed that the group that did not sleep performed worse than the controls. In particular, the coding and recall of positive stimuli were impaired, and the recall of negative stimuli was relatively preserved. Based on these results, it has been claimed that with sleep deprivation, negative life events are remembered better than positive ones, and there may even be a "bias" in favor of negative events, and this may be one of the reasons for emotional depression (Walker, 2009).

It is known that people experience restlessness and emotional fluctuations during the day with sleep deprivation or limitation of sleep time. In a related experiment, after a night of sleeplessness, participants were shown emotional (positive-negative-neutral) pictures under fMRI recording. As expected, when negative pictures are shown, an increased activation was noted in the amygdala, which is one of the areas related to emotion regulation, both in the group that slept the night before the experiment and in the group that did not sleep, but this increase in activation was found to be 60% higher in the sleep deprived group than in the other group. Another important finding is that the functional connection between the medial prefrontal cortex, which modulates and inhibits the amygdala, and the amygdala is weakened. It has been thought that sleep deprivation causes a hyper-limbic reaction in the face of negative stimulus, and that the top-down suppression of the prefrontal cortex may lead to inadequacies in emotional regulation, rational decision making, and social reasoning.(Walker and van der Helm, 2009).

Although the events we experience emotionally continue to be remembered, their emotional effects decrease over time. Memories detach from the "emotional sheath" they are wrapped in overtime and information remains in its pure form. The intensity of the emotional and physiological responses to the events we experience decreases over time. There are hypotheses that this may be related to sleep, particularly rapid eye movement (REM) sleep. When neuroimaging recognition experiments were performed in the group that was shown emotionally charged pictures and subsequently underwent sleep deprivation, it was observed that amygdala activation, which decreased over time in the sleeping group, did not decrease in the deprived group (Sterpenich et al., 2007).

1.8 COVID – 19 Pandemic

Coronavirus Disease (COVID-19) is a virus that first emerged as a result of research conducted in a group of patients who developed respiratory symptoms (fever, cough, shortness of breath) in late December in Wuhan Province, China. Covid-19 first appeared in Wuhan and then affected the whole world.

The World Health Organization classified the COVID-19 outbreak as an "international public health emergency" on January 30 and defined as pandemic on March 11 due to the spread and severity of the virus, the occurrence of COVID-19 cases in 113 countries outside China, where the first epidemic started. Pandemic is that the spread of a disease or an infectious agent in a very wide area such as countries, continents and even the whole world (T.C. Sağlık Bakanlığı, 2020a).

The most common symptoms of COVID - 19 are fever, dry cough and tiredness also aches and pains, sore throat, diarrhea, conjunctivitis, headache, loss of taste or smell, a rash on skin, or discoloration of fingers or toes are the less common symptoms and difficulty breathing or shortness of breath, chest pain or pressure and loss of speech or movement are the serious symptoms of the Covid-19 disease. Symptoms can appear after 5-6 days and sometimes within 14 days when someone is infected with the Coronavirus. Coronavirus can also be detected in respiratory tract secretions of asymptomatic people and these people can be contagious.

1.9 Epidemiology

A case of pneumonia of unknown cause was reported on December 31, 2019, in Wuhan City, Hubei Province, China. It is known that there is a group of employees at the China Seafood City Market (a wholesale fish and livestock market that sells various animal species) in the south of Wuhan. Findings compatible with fever, shortness of breath, and bilateral pneumonia infiltration were found in the case.

According to the COVID-19 report of the People's Republic of China by WHO, death cases were generally individuals with advanced or accompanying systemic diseases (hypertension, diabetes, cardiovascular disease, cancer, other immunosuppressive conditions, especially chronic lung diseases).

The virus released by droplets during coughing, sneezing or speech of COVID-19-positive individuals can be transmitted to another person by direct contact with mucous membranes or may also occur because of touching the mouth, nose or oral mucosa of the hands after touching the infected surfaces with the virus.

It is also known that the droplets do not travel beyond about 2 meters and do not hang in the air. Generally, it is not very resistant to the external environment, alcohol, and disinfectants, but it can stay alive until 72 hours on plastic and steel surfaces; up to 24 hours in cartons. SARS-CoV-2 has also been detected outside the respiratory system, such as feces and blood, but the roles of these regions in transmission are unclear (Şirin and Özkan, 2020).

The duration of persistence on inanimate surfaces varies from minutes to a month, linked to the amount of virus, environmental factors such as temperature and humidity.

SARS-CoV-2 can stay airborne for at least 30 minutes in non-ventilated closed buses without loss of infectivity (Ren et al., 2020). Various disinfectants (including ethanol at 62-71% concentrations) have been shown to inactivate certain viruses related to SARS-CoV-2 within 1 min (Kampf et al., 2020). This highlights the importance of environmental disinfection. The duration of transmission of individuals carrying the virus in COVID-19 infection is currently unknown.

Coronaviruses are viruses that are usually intolerant of the external environment. There is an endurance period that varies depending on factors such as the humidity and temperature of the environment, the amount of organic matter emitted, and the texture of the contaminated surface it is generally accepted that an inanimate surface loses its activity within a few hours. When assessing the activity time on inanimate surfaces, it's vital to consider not only the virus's activity in the contamination, but also the length of contact (T.C. Sağlık Bakanlığı, 2020a).

1.10 Immunity and Reinfection Risk

The Coronavirus causes different effects on each individual and every age group**.** It is more severe especially in elderly individuals with chronic diseases such as asthma, cardiovascular diseases, respiratory tract diseases, diabetes, which include various risk factors and have prolonged disease periods and may result in death. Conversely, while the virus does not show any symptoms on some individuals, it follows a milder form on some individuals (Aykut and Aykut, 2020)

The rate of infection is much less common in children and young adults. Asymptomatic infection rate is also very high in these groups. Although all individuals are susceptible to COVID-19, individuals over the age of 50, those with chronic diseases (heart disease, hypertension, chronic obstructive pulmonary disease, diabetes, etc.) are defined as more risky groups.

The disease not only affects individuals physically, but also disrupts the economic, social, and psychological balances of individuals and societies. The rapid spread of the disease and the increase in the number of infected people causes serious pressure on the health systems of countries. Hospitals, staff capacities of hospitals, number of beds, intensive care units are insufficient, and people cannot benefit from the treatments required for them.

1.11 Precautions to Take for a COVID-19 and Vital Changes in The World

The World Health Organization stated that governments resort to all kinds of prevention to control the spread of the virus.

During the epidemic period, effective measures have been taken to deal with the coronavirus in the world. Various measures are taken at global and national levels to slow down the rate of spread of the coronavirus pandemic and reduce the negative effects it causes. Some countries have also speeded up testing and monitoring programs to suppress the spread of the virus.

Countries' curfews and quarantine procedures related to COVID-19 vary widely. (Kanbur and Akgül, 2020). For example, China has put forward a strict policy since the outbreak, while England preferred the herd immunity approach and followed a loose policy. Adherence to the measures and measures taken by the society has a very important effect in slowing the course of the disease. During the pandemic, while various containment measures applied in China were also accepted and applied by the society, the new case increase rate decreased by 90%, while the same situation was not valid for Italy, one of the countries where the effects of the virus were most seen (Remuzzi and Remuzzi, 2020).

1.12 Precautions to Take for a COVID-19 in Turkey

Covid-19 was seen for the first cases in Turkey on March 11 and the World Health Organization announced that a new virus emerging pandemic on the same date (T.C. Sağlık Bakanlığı, 2020a).

The Coronavirus Scientific Board has been established within the Ministry of Health on January 10. Turkey taken measures in accordance with the recommendations of the scientific committee has implemented gradually. These measures attract attention as practices that affect individual and social life and significantly change people's daily routines (Gencer, 2020).

April 13 data announced by the Ministry of Health revealed that 61,049 new coronavirus cases were detected in Turkey in the last 24 hours. This was recorded as the highest number reached since the beginning of the pandemic (T.C. Sağlık Bakanlığı, 2020b)

Pandemic resulted in taking radical decisions that cause the most significant effects and consequences on social, economic, political, economic, administrative, legal, military, religious and cultural domains in Turkey. The chronological order of measures that especially directly affect social life, within struggle with coronavirus epidemic, are shown in Table 3.

Many aspects of social life such as sports, education, culture and arts, entertainment, transportation/travel, free movement, scientific events were limited, delayed, or temporarily stopped. The epidemic was handled in all aspects on long-term television programs and various social media platforms (Gencer, 2020).

1.13 Effects of COVID-19 Pandemic on Society

A curfew was imposed for certain age groups. Individuals especially elderly individuals have had difficulties to supply their basic vital needs due to curfew. Needs such as shopping, bill payments and cleaning were interrupted and the needs of the elderly individuals who have a family were met by their relatives. The fact that internet usage is not very common among elderly people has not made computer-based shopping and bill payments possible. The elderly who lives alone in their homes feel lonelier and they miss their relatives such as children and grandchildren. In addition, they experience more intensive fear of getting sick and death because of their presence in the risky age group (Aykut and Aykut, 2020).

Table 3. The chronological order of measures in Turkey

Date	Order of measures
March 12, 2020	Suspension of education in primary and secondary education
March 16, 2020	Announcement that places such as cinemas, concert halls, wedding halls, cafes and sports halls will be temporarily closed
March 19, 2020	Suspension of football, volleyball, basketball, and handball leagues
March 20, 2020	Suspension of sort of scientific, cultural, artistic, and similar activities until the end of April
March 21, 2020	Suspension of the activities of barbershops, hairdressers, and beauty centers
March 21, 2020	Curfew for citizens over the age of 65 and with chronic diseases
March 26, 2020	Announcement that face to face education will not be held in universities in the spring term and that the education term will be continued only with distance education
March 27, 2020	Intercity transportation is subject to the governorship's approval
April 3, 2020	Wearing mask has become mandatory in public places such as markets and bazaar
April 3, 2020	Suspension of intercity travel between 30 metropolitan cities for 15 days
April 29, 2021	Implementation of curfew measures for 18 days from April 29 to May 17

Children and adolescents who must stay at home during intense energy periods experience psychological problems because of the regulation prohibiting those under the age of 20 from going out to the streets. Adolescents who participate more actively in life stay away from their social environment and cannot socialize at the desired level. Rapid mood changes are experienced more frequently in childhood and adolescence. Emotional problems of adolescents vary by their age group, educational processes, individual intelligence, environment and family relationships (Koç, 2004). The emotional changes experienced deepen especially with the effect of the pandemic process.

Family members who have to stay together at home cannot always communicate well with each other. Situations of intense domestic violence are increasing gradually with the effect of the pandemic. Individuals who cannot leave the house become increasingly depressed, and this situation prepares the ground for violence against women. Violence against women can be physical, emotional, sexual, verbal and economic (Aykut and Aykut, 2020).

The coronavirus pandemic process which is encountered without preparation has a negative economic impact on individuals and society. All countries in the world make pandemic plans and policy studies because the economy can experience sharp shocks during pandemic periods (MacIntyre, 2020). Decreases in international trade, capital flow, human mobility and pressures on the health system affect the economy negatively. This situation is reflected badly on individuals and society. Some workplaces were closed for an indefinite period, some individuals had to go on leave, and some individuals left their jobs for various reasons in relation to the effect of the pandemic process. Despite the epidemic period, people working in healthcare and social service institutions such as doctors, nurses and pharmacists are constantly working under stress to increase the well-being of people and slow down the epidemic, regardless of individual interest. They apply individual quarantine to themselves and try to stay away from their loved ones due to the possibility of being contaminated. Considering the size and speed of the epidemic and the number of infected and deaths, the coronavirus epidemic has caused a severe trauma in society. All vital habits of individuals have changed extraordinarily at the social level and suffered great losses at an unexpected moment. Human is a social being and a whole with environment. The new world established for social isolation does not coincide with the nature of the human being and causes deep psychological depressions (Aykut and Aykut, 2020).

The COVID- 19 is associated with situations that can disrupt sleep. Sudden situations and diseases such as coronavirus, losses and disasters cause fear, stress and anxiety for people and cause them to feel more and more intensely depressive. All of life-sustaining changes, stress and depressive emotions may impair regular sleep pattern (Altena et al., 2020).

1.14 COVID-19 and Elderly

The elderly population growth increasingly in Turkey. The old age period that brings along many economic, psychological, social and health related problems for the elderly person and requires coping with each one. Several measures have also been taken for elderly individuals, who constitute the most important risk group in the Covid-19 epidemic. The most important measures of these are that curfew for citizens over the age of 65 with chronic diseases and restrictions on their movement in open areas such as parks and gardens. Elderly individuals who deal with health problems and have difficulty to provide their personal needs may experience intense loneliness and may also feel marginalized because of the social isolation used throughout the outbreak process. (Gencer, 2020).

The prevalence of social isolation is already increasing with aging. Elderly individuals generally have smaller social network, and they are more prone to loneliness. This can be associated with the elders' tendency to free from roles. Also, reduced economic and social resources, deaths of relatives, friends and spouses, and changes in family structure are among the causes of loneliness. The feeling of loneliness may be an important factor in the increase of other illnesses for these individuals (Dere et al., 2020). Some studies showed that the impacts of isolation and loneliness on health and mortality are equivalent to impacts of high blood pressure, obesity, and smoking (Courtin and Knapp, 2017).

CHAPTER 2: METHODS

2.1 Participants

244 participants have participated in this study. The sample consisted of three age groups. The age groups of the participants to take part in the study were determined as 18-40 for young individuals, 40-60 for middle aged individuals and 60-80 for elderly individuals. There were 113 participants in the 18-40 age group, 42 participants in the 40-60 age group and 89 participants in the 60+ age group. 165 of the participants were women and 79 of them were men.

2.2 Procedure

The researcher collected the data by sharing the questionnaire link with the participants through different channels (social media, mail groups, etc.). The participants were asked to fill out an online survey via Google Forms. The participants were asked for consent via the online questionnaire, that was created via Google Forms. The informed consent and questionnaire will be included in the Appendix A. Due to social distancing measures the contact was restricted to the virtual platform. Before completing the questionnaires, the participants received a contact mail address where they can ask for further information about the progress and/or potential results of the study. All data was collected during the period from early February to late April 2021.

2.3 Materials

A new questionnaire has been prepared to determine the sleep problems of individuals during the COVID-19 period. This questionnaire form was prepared by revising some items of the Insomnia Severity Index (Morin et al., 2011) and Pittsburgh Sleep Quality Index (Buysse et al., 1989) scales used in the literature, and it was adapted to the COVID-19 epidemic process by adding questions about COVID-19.

The questionnaire administered during this study consists of 64 items. The questionnaire included 19 five-point Likert-type questions, 19 yes-no questions, 21 short answer questions, and 5 multiple choice question types.

Participants were asked to fill out a questionnaire, starting with questions about socio-demographic characteristics. These socio-demographic questions included questions such as age, gender, marital status, education level, and profession of the participants. After the participants answered the socio-demographic questions in the questionnaire, they came across the section with questions about sleep patterns. Finally, they completed the questionnaire by answering the section with questions about COVID-19.

2.4 Data Analysis

After collecting the questionnaire data, descriptive statistics (means, standard deviations, frequencies, and percentages) and correlations of variables were computed by using SPSS version 21. Factor analysis was applied to reduce the number of variables and to group similar variables into dimensions. A principal axis factor analysis was conducted on the 12 items with oblique rotation (Promax). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO = .87 that means meritorious (Hutcheson and Sofroniou, 1999). The items that cluster on the same factor suggest that factor 1 represents sleep quality and factor 2 represents sleeplessness. The Cronbach's alpha reliability coefficients were calculated for measuring the internal consistency of each item. Sleep quality had high reliability, Cronbach's $\alpha = .83$ and sleeplessness also had high reliability, Cronbach's $\alpha = .81$. To determine the relationship between the independent (age groups) and dependent variables (sleep quality and sleeplessness), ANOVA and A Kruskal-Wallis H test analysis technique were used.

The differences in the sleep quality and sleeplessness based on sociodemographic characteristics were analyzed using ANOVA, independent t-test, and Kruskal-Wallis t-test. Before the analysis, each participant was assigned a random number generated in Excel 2016 to equalize the sample numbers of the groups to be compared.

CHAPTER 3: RESULTS

3.1 Preliminary Analyses

Two separate Spearman Rho correlation analyses were conducted to investigate the relationship between variables. The means, standard deviations, and inter-correlations among variables are reported in Table 4 and Table 5.

Results of correlation analysis showed that the level of stress caused by sleep problems, r_s = .23, 95% BCa CI [-.034, .442], p = .04, using digital devices before sleeping, r_s = .16, 95% BCa CI [.053, .278], p = .02, the stress level of the work environment related to Covid – 19, r_s = .32, 95% BCa CI [.074, .575], p = .00, and the mood get impacted when your relatives got Coronavirus, r_s = .27, 95% BCa CI [.086, .448], p = .01 were significantly related to sleeplessness.

In addition, results of correlation analysis showed that sleep quality was significantly related to how many times a day to check news about Covid-19, r_s = -.19, 95% BCa CI [-.317, -.071], p = .01. Also sleep quality had a significant negative correlation with all variables; frequency of waked up with headache, r_s = -.36, 95% BCa CI [-,453, -,269], p = .00, frequency of nightmares in a week, r_s = -.33, 95% BCa CI [-.440, -.219], p = .01, frequency of waking from sleep at a night, r_s = -.36, 95% BCa CI [-.466, -.236], p = .00, urinary frequency at a night, r_s = -.14, 95% BCa CI [-.312, -.020], p = .03, frequency of drinking alcohol, r_s = -.33, 95% BCa CI [-.530, -.040], p = .01, frequency of sleep deprivation in a week, r_s = -.47, 95% BCa CI [-.565, -.369], p = .00 and frequency of feeling tired and sluggish when waking up in the morning r_s = -.66, 95% BCa CI [-.734, -.581], p = .00. In addition, frequency of waked up with headache was significantly related to frequency of sleep deprivation in a week, r_s = .34, 95% BCa CI [.215, .445], p = .00 and frequency of feeling tired and sluggish when waking up in the morning, r_s = .35, 95% BCa CI [.227, .486], p = .00. Frequency of nightmares in a week had a statistically significant correlation with frequency of sleep deprivation in a week, r_s = .23, 95% BCa CI [.070, .362], p = .00, and frequency of feeling tired and sluggish when waking up in the morning, r_s = .39, 95% BCa CI [.255, .502], p = .00. Also, frequency of waking from sleep at a night had a statistically significant correlation with frequency of sleep deprivation in a week, r_s = .14, 95% BCa CI [.008,

.275], $p = .03$, and frequency of feeling tired and sluggish when waking up in the morning, $r_s = .13$, 95% BCa CI [-.024, .245], $p = .04$. Lastly, urinary frequency at a night had a significant correlation with frequency of waking from sleep at a night, $r_s = .52$, 95% BCa CI [.405, .634], $p = .00$.

Table 4. Descriptive Statistics and Spearman Rho correlation coefficients

Measure	M	SD	1	2	3	4	5
1. Sleeplessness N= 244	3.28	.92	1				
2.How stressful is your sleep problem? N=84	2.32	.78	.225*	1			
3. Do you use digital devices such as tablets and phones just before sleep? N=244	1.27	.44	.158*	-.011	1		
4. Does your work environment cause stress for you related to Covid-19? N=100	2.86	1.43	.324**	.146	.227*	1	
5. How has your mood get impacted when your relatives got Coronavirus? N=100	2.18	1.08	.267**	.324**	.251*	.270	1

Note. *p < .05 (two tailed). **p < .01 (two tailed).

Table 5. Descriptive Statistics and Spearman Rho correlation coefficients

Measure	M	SD	1	2	3	4	5	6	7	8	9
1.Sleep Quality N= 244	3.21	1	1								
2. How many times a day do you check news about Covid-19? N=244	1.72	1.45	-,186**	1							
3. How many times per week did you wake up with a headache? N=244	1.76	1.83	-.361**	.017	1						
4. How many times a week do you have spooky, bad dreams that bother you? N=244	1.20	1.48	-.326**	.113	.338**	1					
5. How many times do you wake up at a night? N=244	1.96	1.51	-.362**	.103	165**	.170**	1				
6. How many times do you use the restroom at a night?	1.25	1.22	-.142*	.184**	-.021	.002	.520**	1			

N=244											
7. How many glasses a day do you drink when you drink alcohol? N=61	2.56	1.09	-.333**	.341**	.156	.230	-.090	.126	1		
8. How many times a week have you sleep deprivation? N=244	2.40	2.16	-.474**	.098	.338**	.228**	.136*	-.009	.085	1	
9. How many times a week would you feel tired and sluggish when you wake up in the morning? N=244	2.55	1.92	-.661**	.075	.352**	.394**	.128*	-.020	.286*	.361**	1

Note. *p < .05 (two tailed). **p < .01 (two tailed).

3.2 Comparison of Age Groups in terms of Sleeplessness

Before conducting analysis, assumptions were tested**.** The Kolmogorov Smirnov tests showed no significant deviation from normality for the effect of 18-40 age group on sleeplessness, *D* (113) = .071, *p* = .200, the effect of 40-60 age group, *D* (42) = .131, *p* = .067 and the effect of 60+ age group on sleeplessness, *D* (89) = .093, *p* = .054. Levene’s test showed that homogeneity of variance assumption is not significant for sleeplessness, *F* (2, 241) = .268, *p* > .05, means that equal variances can be assumed. A one-way independent ANOVA was conducted to investigate how different age groups affected sleeplessness. Results of the analysis revealed that there was a significant effect of sleeplessness on age groups, *F* (2, 241) = 8.01, *p* = .000. Gabriel post hoc tests revealed that the sleeplessness scores was significantly higher on 60+ age groups than 18-40 age groups (*p* < .001). However, there was no significant difference in the sleeplessness of 40-60 age groups and both, 18-40 and 60+ age groups, *p* > .001. Mean sleeplessness scores of age groups are shown in Figure 3.

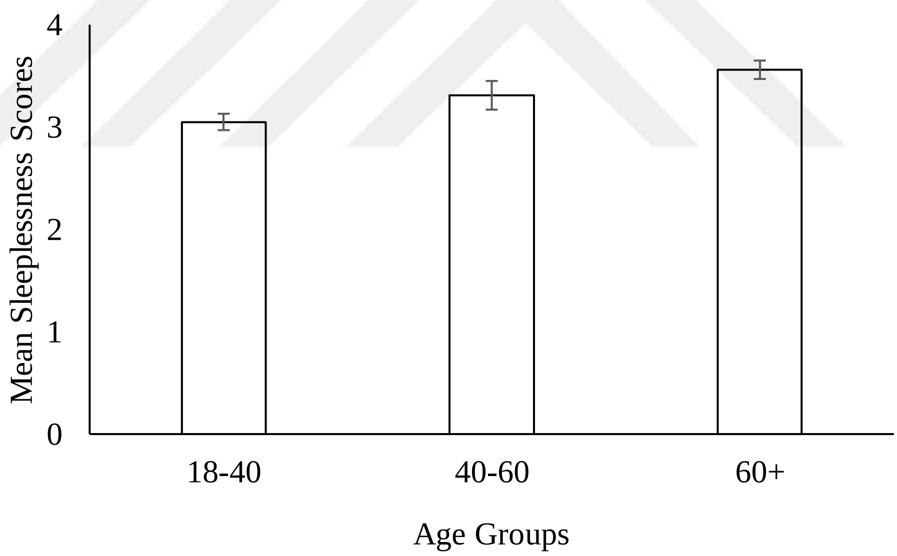

Figure 3. Mean (with 95% CI) sleeplessness scores of participants by age groups

3.3 Comparison of Age Groups in terms of Sleep Quality

Before conducting Kruskal Wallis-H Test, assumptions were tested**.** Sleep quality scores of 18-40 age group, *D* (113) = 0.111, *p* < .05, and 60+ age groups, *D* (89) = 0.102, *p* < .05 were significantly different from normal distribution. However, scores of 40-60 age group, *D* (42) = 0.085, *p* = .200 were normally distributed. The variances were not roughly equal for sleep quality, *F* (2, 241) = 4.95, *p* < .05.

A Kruskal-Wallis H test was conducted to investigate the effect of age groups on sleep quality. Results of the test showed that there were no significant differences between age groups on sleep quality, H (2) = 0.54, p = .765. Mean sleep quality scores of age groups are shown in Figure 4.

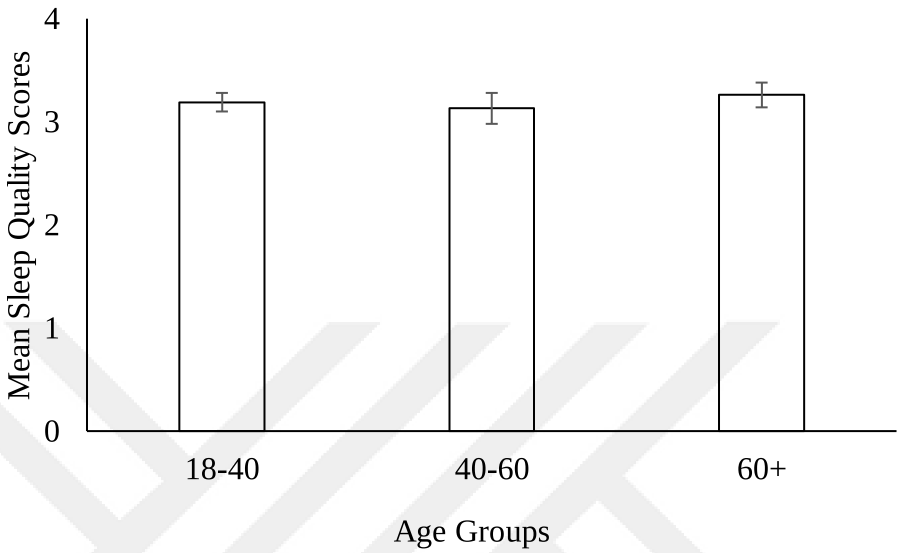

Figure 4. Mean (with 95% CI) sleep quality scores of participants by age groups

3.4 Comparison of Mean Scores between Female and Male Participants

The K-S tests showed significant deviation from normality for female, D (79) = .186, p = <. 05 and male, D (79) = .185, p = <. 05 on sleep quality. However, for both female, D (79) = .080, p = 200, and male, D (79) = .092, p = .094 on sleeplessness, there were no significant deviation from normality.

Levene's test showed that homogeneity of variance assumption is not significant for both sleep quality F (1, 156) = .204, p > .05 and sleeplessness, F (1, 156) = .282, p > .05, means that equal variances can be assumed.

An independent-samples t-test was conducted to compare sleeplessness and sleep quality scores of female and male participants. On average, male participants had higher sleeplessness scores (M = 3.62, SE = .103) than female participants (M = 3.08, SE = .078). This difference, -0.54, BCa 95% CI [−0,79, -0,05], was significant t(200) = -4.22, p =.000, it did represent a medium-sized effect, d=0.6. However, there was no difference between female participants (M = 3.13, SE = .87), and male participants (M

= 3.38, *SE* = .122) for sleep quality scores. This difference, -0,25, BCa 95% CI [-0,54, 0,041], was not significant *t* (200) = -1.69, *p* =.092, *d* = -0.2. Gender related sleep quality and sleeplessness mean scores of participants are shown in Figure 5.

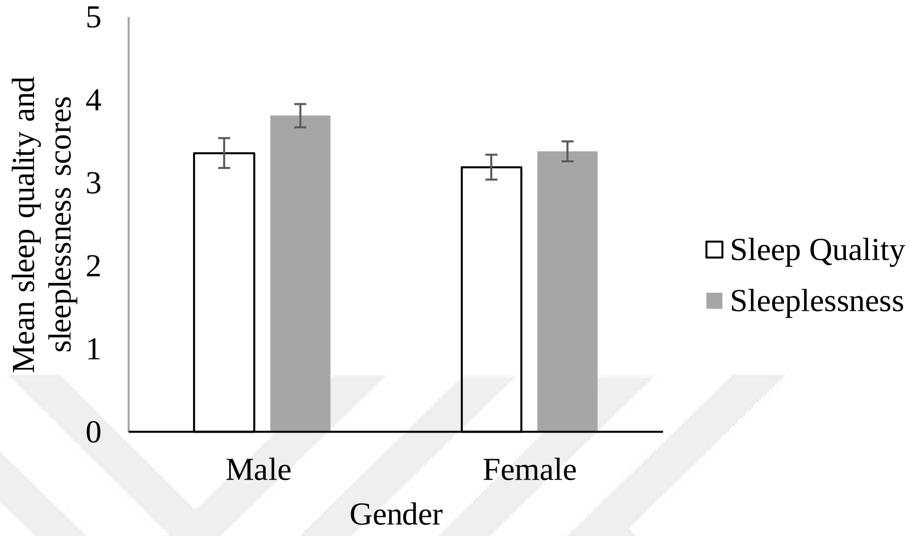

Figure 5. Mean (with 95% CI) sleep quality and sleeplessness scores of participants by gender

3.5 Comparison of Mean Scores between Worker and Nonworker Participants

The K-S tests showed significant deviation from normality for worker groups on sleep quality, *D* (95) = .104, *p* = <.05. However, for nonworker group on sleep quality, *D* (95) = .077, *p* = .200, there were no significant deviation from normality.

Sleeplessness scores of worker group, *D* (95) = .071, *p* = .200, and nonworker group, *D* (95) = 074, *p* = .200, were normally distributed.

Levene's test showed that homogeneity of variance assumption is not significant for both sleep quality *F* (1, 188) = .550, *p* > .05 and sleeplessness, *F* (1, 188) = .202, *p* > .05, means that equal variances can be assumed.

An independent-samples t-test was conducted to compare sleeplessness and sleep quality scores of workers and nonworker participants. On average, nonworker participants had higher sleeplessness scores (*M* = 3.29, *SE* = .096) than worker participants (*M* = 3.21, *SE* = .094). This difference, -0.8, BCa 95% CI [−0,34, 0,19], was not significant *t* (188) = 1.28, *p* =.20. Also, there was no significant difference between worker participants (*M* = 3.31, *SE* = .09), and nonworker participants (*M* = 3.15, *SE* = .10) for sleep quality scores, *t* (200) = -1.69, *p* =.092. Work Conditions related sleep quality and sleeplessness mean scores of participants are shown in Figure 6.

Figure 6. Mean (with 95% CI) sleep quality and sleeplessness scores of participants by work conditions

3.6 Comparison of Mean Scores of Participants by Living Conditions

The K-S tests showed no significant deviation from normality for the participants living alone, *D* (55) = .082, *p* = .200 and participants living with their partners on sleep quality, *D* (55) = .101, *p* = .200, participants living with their families on sleep quality, *D* (55) = .135, *p* < .05, were significantly different from normal distribution.

Sleeplessness scores of participants living alone, *D* (55) = .93, *p* = .200, participants living with their families, *D* (55) = .110, *p* = .092 and participants living with their partners, *D* (55) = 0.101, *p* = .200 and were normally distributed.

Levene’s test showed that homogeneity of variance assumption is not significant for sleep quality, *F* (2, 162) = .620, *p* > .05, means that equal variances can be assumed. However, the variances were not roughly equal for sleeplessness, *F* (2, 241) = 4.98, *p* > .05.

A one-way independent ANOVA was conducted to investigate how different living conditions affected sleep quality. Results of the analysis revealed that there was not a significant effect of sleep quality on living conditions of participants, F (2, 162) = 2.05, p = .131. Living conditions related sleep quality mean scores of participants are shown in Figure 7.

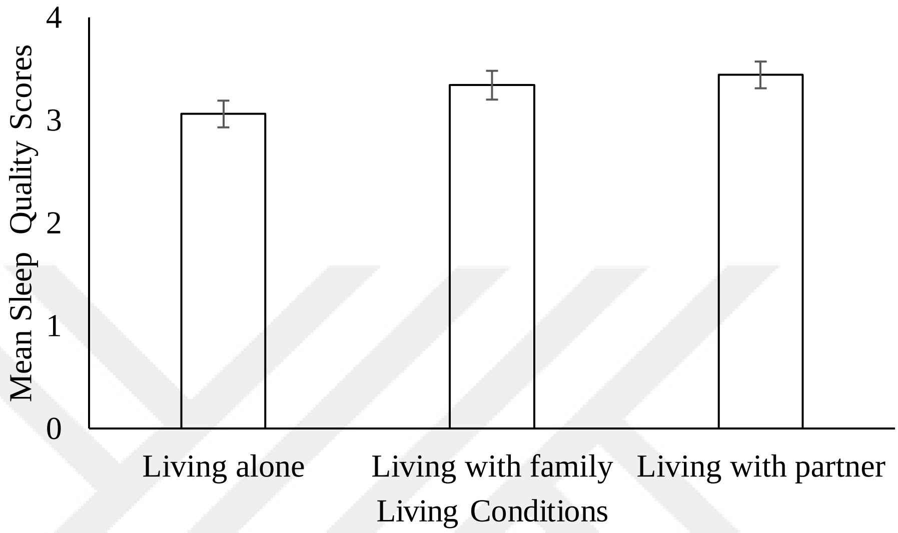

Figure 7. Mean (with 95% CI) sleep quality scores of participants by living conditions

A Kruskal-Wallis H test was conducted to investigate the effect of different living conditions on sleeplessness. Results of the test showed that there were no significant differences between living conditions on sleep quality, H (2) = 2.61, p = .271. Living conditions related sleeplessness mean scores of participants are shown in Figure 8.

3.7 Comparison of Mean Scores of Participants by Having Child

The K-S tests showed significant deviation from normality for the effect of having child on sleeplessness, D (119) = .086, p < .05. However, not having children on sleeplessness, D (119) = .081, p = .053, were normally distributed.

Having child on sleep quality, D (119) = .074, p = .161, were normally distributed. However, not having children on sleep quality, D (119) = .102, p < .05 were Levene's test showed that homogeneity of variance assumption is not significant for both sleeplessness, F (1, 236) = .412, p > .05, and sleep quality, F (1, 236) = 1.07, p > .05, means that equal variances can be assumed.

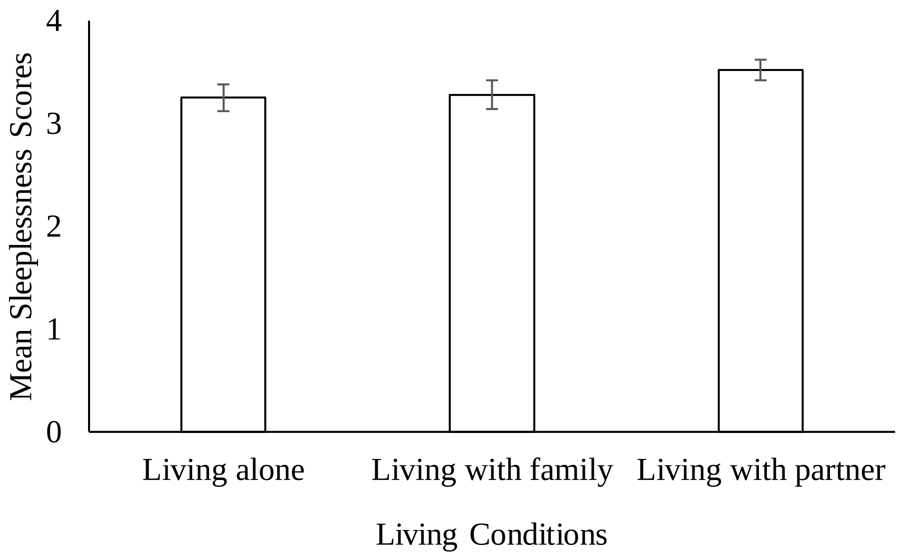

Figure 8. Mean (with 95% CI) sleeplessness scores of participants by living conditions

An independent-samples t-test was conducted to compare sleeplessness and sleep quality scores of participants who have a child and have not a child**.** On average, participants who have a child had higher sleeplessness scores (*M* = 3.52, *SE* = .082) than participants who have not a child (*M* = 3.02, *SE* = .079). This difference, 0.49, BCa 95% CI [0,27, 0,72], was significant *t* (236) = 4.36, *p* = .000. However, there was no significant difference between participants who have a child (*M* = 3.31, *SE* = .09), and participants who have not a child (*M* = 3.15, *SE* = .08) for sleep quality scores, *t* (236) = 1.68, *p* =.094. Having child related sleep quality and sleeplessness mean scores of participants are shown in Figure 9.

3.8 Results of Simple Linear Regression

A simple linear regression was calculated to predict sleeplessness based on the stress level of the work environment related to Covid-19. The results of the regression suggested that 19 % of the variance, R^2 = .191, *F* (1, 78) = 18.42, *p* = .00. The stress level of the work environment significantly predicted sleeplessness, β = .28, *t* = 4.29, *p*<.00 (Table 6).

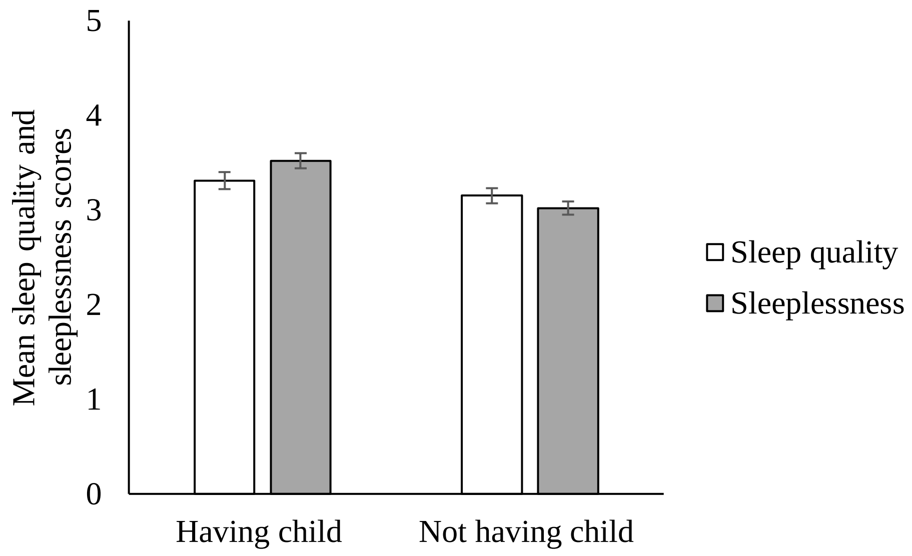

Figure 9. Mean (with 95% CI) sleep quality and sleeplessness scores of participants who have a child and not have a child

Table 6. The simple linear regression analysis for variables

Model	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	Std. Error	Beta		
(Constant)	2,332	,213		10,944	,000
Does your work environment cause stress for you related to Covid-19?	,275	,064	,437	4,291	,000

3.9 Moderating Satisfaction of Working from Home in The Relationship between Having Child and Sleeplessness

A moderation analysis was tested to investigate whether the association between having child and sleeplessness depends on the satisfaction of working from home. Results indicated that having child (B = -0.47, SE = 0.11, t = -4.04, p < .05) was associated with sleeplessness. However, satisfaction of working from home child (B = -0.0002, SE = .0001, t = 1.44, p < .05) was not associated with sleeplessness. The interaction between having child and satisfaction of working from home was also significant (B = -.0008, SE = .0003, t = -2.97, p < .05), suggesting that the effect of having child on sleeplessness depended on the satisfaction of working from home.

Together, the variables accounted for approximately .11 % of the variance in sleeplessness, R^2= .11, F (3, 204) = 9.30, p < .001 (Table 7). Figure 10 shows that participants who had children had more sleeplessness than the participants who did not have children.

Table 7. Linear model of predictors for sleeplessness

	b	*SE B*	*t*	*p*
Constant	3.23 [3.12,3.3]	0.057	56.15	$p < .05$
Having Child	-0.47 [-.69, -.24]	0.115	-4.04	$p < .05$
Satisfaction of working from home	.0002	.0001	1.44	$p = .15$
Having Child x Satisfaction of working from home	-.0008	.0003	-2.97	$p < .05$

Note. R^2 = .11

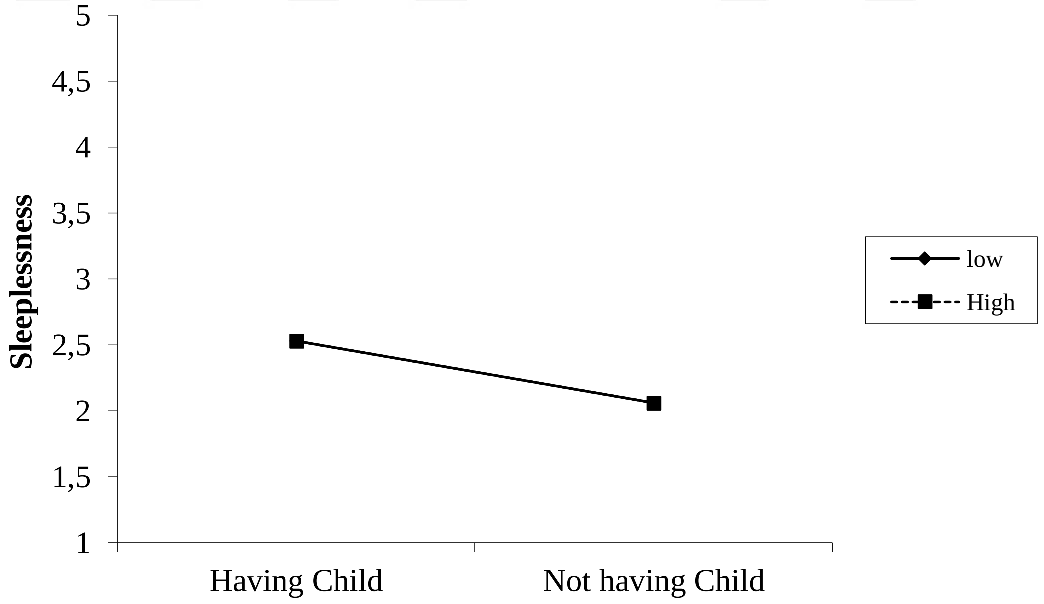

Figure 10. Relationship between having child and not having child predicting sleeplessness

CHAPTER 4: DISCUSSION

The results of this study showed that older individuals experience more sleeplessness than younger individuals during the COVID-19 pandemic. In addition, the results showed that there were no significant differences between age groups on sleep quality.

As age progresses, shortening of sleep duration, prolongation of sleep latency and shortening of REM sleep are expected conditions (Walsh et al., 2011). Also, the elderly population is more likely to have insomnia than younger people (Tasnim et al., 2020). However, several studies have identified more insomnia in young people during the pandemic period. It has been stated that this remarkable result may be caused by stressful factors such as academic and process uncertainty experienced by young people in this process (Alvaro, Roberts and Harris, 2013). According to the study conducted in Turkey that university students participated, it was determined that the participants generally had poor sleep levels and sleep quality did not differ as to whether they were subject to curfew, while the severity of insomnia differed (İlhan Alp et al., 2020).

The frequency of insomnia also varied in geographical regions in coronavirus pandemic. In the United States, the incidence of insomnia has been reported as 30% (Bhargava, Sarkar and Kroumpouzos, 2020). For this reason, it was thought that the reason why insomnia is less in some regions may be due to the differences in the isolation or quarantine attitudes of these regions (Tasnim et al., 2020). In the studies, insomnia was found to be higher in women, and this is explained by the fact that the female gender may be more prone to anxiety and depression (Albert, 2015). In this study, it was found that male participants had higher sleeplessness scores than female participants.

According to the study conducted in China, 18.2% of adults had poor sleep quality (Huang and Zhao, 2020). Similarly, the findings of the other study showed 71.98 % of the participants experienced psychological distress, and 55.1 % of the individuals had poor sleep quality (Domínguez-Salas et al., 2020).

It was found that people who left work during the pandemic had poorer sleep quality than those who worked from home/office or those who were already unemployed before the pandemic. (Duran and Erkin, 2021).

The sleep quality of single participants in this study was not different than that of married participants. The other study discovered that single people have inferior sleep quality than married people. It is thought that single participants may have felt increased social isolation, which may have harmed their sleep quality (Deo et al., 2020).

In this study, the sleep quality and insomnia scores of the working and non-working participants were compared by eliminating the participants who were healthcare professionals. The results of this study determined that there was no significant difference between worker and non-worker participants for sleep quality and sleeplessness scores. Several research on the general population and risk groups, such as healthcare professionals and students, have shown that poor sleep quality has a negative impact on mental health (Kandeger et al., 2018).

In this study, participants who have a child had higher sleeplessness scores than participants who have not a child. In the other study, the psychological distress levels of people who had children were found to be higher than people who not had children. (Duran and Erkin, 2021). In another study conducted in Turkey, it was discovered that people who had trouble caring for their children had higher anxiety levels (Hacimusalar et al., 2020). It is thought that the heightened stress experienced by parents because of school closures during the pandemic process contributed to greater psychological discomfort.

This study has several limitations. In this study, a comparison between pre-Covid 19 and during-Covid-19 sleep patterns could not be made due to the lack of data for the pre-Covid-19 period. In addition, a web-based questionnaire was used to collect data, enabling possible selection bias in this study. The sample of this study includes the more literate and at least virtually more social population with access to digital resources due to the online survey method is used. As the study was conducted using an online questionnaire, those who were unable to access the questionnaire's sleep quality and sleeplessness could not be analyzed. As the study's findings are limited to a small sample, they may not be generalized to all of population. It is difficult to make causal inferences as the data used in the study and related analyzes are derived from a cross-sectional design.

There is a direct relationship between sleep quality and quality of life (İyigün et al., 2017). Impairment of sleep structure and quality causes cognitive dysfunction, increase in the incidence of chronic diseases, fatigue, decrease in attention and memory, loss of physical performance, anxiety and depression (Xie et al., 2017).

Perceiving and treating sleeplessness is particularly important to alleviate psychological suffering and avert future health issues during distressing occasions such as COVID-19 pandemic. The results of this study may support the implementation of some interventions for well-being during the pandemic process. It would be important to provide psychological support and psycho-educational interventions to maintain a normal sleep-wakefulness, especially for vulnerable groups such as the elderly.

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