

Analysis of Machine Deficiencies of Ships Detained Under the Black Sea Memorandum

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Abstract

Approximately 90% of the goods are transported worldwide by ships. Ensuring the safety of life and property in maritime transportation is one of the most important issues. The procedures applied to foreign flagged ships in ports in order to determine that the standards of the ships and the equipment on these ships comply with international regulations and that these rules are complied with in the operation of the ships is called port state inspection. Port state inspections are extremely important in terms of withdrawing substandard ships from transportation and preventing maritime accidents. In the research, within the framework of the Black Sea Memorandum, of which Turkey is a member, it is aimed to determine the relations between the reasons for the detention of the ships as a result of the port state inspections at the Black Sea ports due to machinery deficiencies and the ship flag, gross tonnage, ship age, classification society, the country that decided to detain, and the type of ship. For this purpose, data on the ships detained between 2016 and 2018 were obtained from the official website of the Black Sea MOU and evaluated using the IBM SPSS Statistics 22 program. According to the findings, it was determined that there was a statistically significant relationship between the reasons for detention due to machinery deficiencies and the ship's flag, ship age, ship gross tonnage, classification society and the country that made the decision to detention, but the relationship between ship type and the reasons for detention was not significant.

Keywords: Black Sea Memorandum of Understanding, Ship detention, Port state control,

Karadeniz Memorandumu Kapsamında Tutulan Gemilerin Makine Bulgularının Analizi

Öz

Dünya genelinde taşınan emtianın yaklaşık % 90'ı gemiler ile taşınmaktadır. Bu taşımacılıkta can ve mal güvenliğinin sağlanması en önemli hususlardandır. Gemilerin ve bu gemilerde bulunan ekipmanların standartlarının uluslararası düzenlemelere uygun olduğunu ve gemilerin işletiminde bu kurallara uyum sağlandığını belirlemek amacıyla limanlardaki yabancı bayraklı gemilere uygulanan işlemlere liman devleti denetimi denir. Liman devleti denetimleri standart altı gemilerin taşımacılıktan çekilmesi ve deniz kazalarının önlenmesi bakımından son derece önemlidir. Araştırmada, Türkiye'nin de üyesi olduğu Karadeniz Mutabakatı çerçevesinde, Karadeniz limanlarında yapılan liman devleti denetimleri sonucu tutulan gemilerin makine eksikliklerinden dolayı tutulma nedenleri ile gemi bayrağı, groston, gemi yaşı, klas kuruluşu, tutma kararı veren ülke ve gemi tipi arasındaki ilişkilerin belirlenmesi hedeflenmiştir. Bu amaçla Karadeniz Mutabakatı resmi internet sayfasından 2016-2018 yılları arasında tutulan gemilere ilişkin veriler alınmış ve IBM SPSS İstatistik 22 programı kullanılarak analiz edilmiştir. Elde edilen bulgulara göre makine eksikliklerinden dolayı tutulma nedenleri ile gemi bayrağı, gemi yaşı, gemi grostonu, klas kuruluşu ve tutma kararı veren ülke arasında istatistiksel açıdan anlamlı bir ilişki olduğu ancak, gemi tipi ile tutulma nedenleri arasında ilişkinin anlamlı olmadığı belirlenmiştir.

Anahtar Kelimeler: Karadeniz Mutabakatı, Gemi tutma, Liman devleti denetimleri.

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1. Introduction

Maritime transportation, which is widely employed in worldwide trade, has a long history that dates back to ancient times, when people took advantage of the opportunities and conveniences given by the seas. Maritime transport, which is in a continuous development process, is an important mode of both national and international freight transport. In order to carry out maritime transport, which has made an important contribution to the development of world trade, with the safety of life and property and better protection of the marine environment, various international organizations have been established over time and many rules have been developed by these organizations. In particular, the negative consequences of accidents at sea have led to the long-standing need to recognise substandard ships as a major cause of accidents at sea, maritime safety, protection of the marine environment, and verification of the adequacy of living and working conditions on board. The fact that the marine environment is one of the world's most valuable and sensitive resources and is recognized as a common resource has necessitated the adoption of global, regional and national measures to manage and protect the marine environment and its resources in a sustainable way (Usoro, 2014; Uçar, 2019).

The Titanic accident led to the start of the first international initiative on maritime safety, and technological developments and maritime accidents for various reasons led to some studies targeting continuous improvement in this area. The most important issue in this process was the agreement on the establishment of the International Maritime Organization in 1948 and this Convention was put into force in 1958. The International Maritime Organization operates in the fields of leading the regulation of international norms in the seas, taking the necessary measures for the safety of navigation and the protection of the marine environment, ensuring cooperation between countries, and creating effective rules for the efficiency of maritime operations (Yavuz, 2003; Alan, 2010; Uçar, 2019).

Ships employed in transportation activities in world trade carry out these activities by using the ports of various countries. In addition, developing world trade increases the demand for maritime transport. In particular, the negative consequences of accidents at sea have led to the long-standing need to recognize substandard ships as a major cause of maritime accidents, maritime safety, the protection of the marine environment and the review of the adequacy of living and working conditions on board. In addition, there are many legal obligations and related sanctions for ships to comply with international standards. The goal of Port State Control is to ensure the safety of ships and crews, as well as to avoid marine pollution, while inspecting the operating conditions of the shipping crew and vessel. These inspections have an important role in the fight against substandard maritime transport in terms of safety, security and environment, and the target is to determine the substandard working

vessels and to ensure that maritime transport operates in accordance with international rules (Eyigün, 2013; Turk Loydu, 2020). In addition, port state controls improve information sharing in maritime by ensuring that global maritime standards are applied consistently to ships with different flags.

Ships are selected for inspection based on inspection history and consideration of generic factors such as age, vessel type, and vessel risk type. Results obtained by evaluating all aspects of background and generic factors are a priority indicator. In this case, it is determined whether the ship is high standard and low risk and the inspection frequencies are adjusted accordingly (Knapp, 2007).

Numerous studies have been carried out on different issues related to port state control (Cariou et al., 2008; Chien et al., 2020; Şanlıer, 2020; Fan et al., 2022). In order to build the ship detention decision-making mechanism and ship-selection mechanism, local and international academics concentrate on relevance on detention variables and pattern study in their work on PSC detention. In a study carried out by Bolat and Alpaslan (2021) the inspections and detentions under the Paris MoU in 2019 have been examined and analysed by countries and regions. In their study, Chain et al. (2019) used the grey rational analysis (GRA) model to investigate the reasons that led to the detention of ships under PSC. They found from the model that ISM, emergency systems and fire safety measures, all with grey relevance above 0.75, are the biggest contributors in ship detention.

In this study, the reasons for the detention of the ships, which were detained due to machinery deficiencies as a result of the inspections made by the member states of the Black Sea MOU (Memorandum of Understanding), were analyzed and the relations between the ship's flag, gross tonnage, ship age, classification society, the country that decided to detained it, and the type of ship were examined.

2. Materials and Methods

The data used in the study were taken from the Black Sea MOU official website (URL-1). These data show the machinery deficiencies of the ships detained in accordance with the Black Sea MOU between 2016-2018.

2.1. Variables of the Study

The independent variables of the research are the ship's flag, gross tonnage, ship age, classification society, the country that decided to detain it, and the type of ship. The dependent variables of the study are the issues that cause the ships to be detained according to machinery deficiencies. These variables are: Certification and documentations, structural conditions, emergency

systems, fire safety, alarms, working and living conditions, propulsion and auxiliary machines, pollution prevention, international safety management code, terms of business.

2.2. Data Analysis

IBM SPSS Statistics 22 (SPSS Inc. Chicago, II. USA) program was used to evaluate the data obtained in the study. Kolmogorov-Smirnov Test was performed to determine whether the data showed normal distribution or not. The Kruskal Wallis Test, which is one of the non-parametric analysis methods, was used for the statistical analysis of the data related to the reasons for retention and other variables (Kruskal, 1952). As a result of these tests, it was decided whether there was a significant relationship between the variables by looking at the chi-square and p-value. Since the level of significance was taken as 95% in the analyzes, the results with a p-value below 0.05 were considered statistically significant (Sümbüloğlu and Sümbüloğlu, 1995).

3. Findings and Discussion

Table 1 shows the machine findings of the reasons for the detention of the ships, which were detained during the port state controls in the Black Sea Ports between 2016-2018, determined according to the ship's flag. Flag countries with total eclipses of 10 or less are not included in this Table.

The analysis of the data in Table 1 shows that 1367 ships were detained in the Black Sea ports according to the findings of the machines. Considering the distribution of the detained ships according to their flags, the least number of detained with 16 ships was seen on the Antigua and Barbuda flagged ships, while the most detained were on Panama flagged ships with 274 ships. During the period of this study, the most common reason for detention in ships detained in Black Sea ports was found to be nonconformities in emergency systems. It was discovered that a sizable portion of the ships arrested during the port state controls conducted at the ports of the Indian Ocean Agreement member states between 2002 and 2009 flew the flag of Panama. In the same study, it was determined that the most deficiencies in the ships detained were about fire safety (Mejia Jr et al., 2010). The flag of the detained ship and the reasons for the detention were shown to have a statistically significant connection (Chi-square= 83,676; $p < 0,05$). A small number of studies on port state controls in the Black Sea found similar results supporting the findings of this study (URL-2). In a study on ships detained in Black Sea ports between 2006 and 2012, it was determined that the largest number of ships detained were Panama-flagged ones (Mert, 2014).

Table 1. Reasons and numbers of detention according to the ship's flag

Country	Reasons of Detention*										Total
	CD	SC	ES	FS	AL	WLC	PAM	PP	ISM	TB	
Türkiye	7	5	16	14	1	8	7	1	10	3	72
Vanuatu	1	3	5	8	-	1	1	1	4	2	26
Ukraine	1	2	2	4	-	-	2	1	5	7	24
Togo	25	10	29	31	-	3	3	5	17	12	135
Tanzania	32	15	28	23	2	17	6	4	15	8	150
Sierra Leone	13	1	16	15	3	4	4	2	14	7	79
Russia	7	8	12	5	-	4	2	3	12	2	55
Panama	37	14	74	65	6	15	12	6	26	19	274
Palau	6	2	10	15	1	1	2	-	8	3	48
Mongolia	4	4	-	5	-	1	-	1	1	-	16
Moldova	29	15	30	19	5	4	4	10	14	6	136
Marshall Islands	1	-	10	7	-	3	2	-	3	2	28
Malta	1	2	6	6	1	2	5	2	4	2	31
Liberia	-	-	9	9	-	4	1	2	2	4	31
Cook Islands	6	3	11	15	2	7	4	-	11	7	66
Congo	1	1	3	6	-	2	2	1	2	1	19
Comoros	11	5	22	20	-	7	6	2	9	6	88
Antigua and Barbuda	1	1	4	2	-	1	2	1	3	1	16
Cambodia	9	2	5	4	-	1	1	2	2	-	26
Belize	7	4	10	6	1	5	2	5	5	2	47
Total	199	97	302	279	22	90	68	49	167	94	1367

*Certification and Documentations (CD), Structural Conditions (SC), Emergency Systems (ES), Fire Safety (FS), Alarms (AL), Working and Living Conditions (WLC), Propulsion and Auxiliary Machines (PAM), Pollution Prevention (PP), International Safety Management Code (ISM), Terms of Business (TB).

Upon looking at the distribution of the reasons for the detention of ships by age groups, it was seen that the highest number of detaining was applied to ships between the ages of 31-40 and the minimum number of detaining was applied to ships in the 0-10 age group (Table 2). It was determined that emergency systems and fire safety non-compliances were considered to be the most common reasons for ship detained in all age ranges. As a result of the Kruskal Wallis test, it was established that there was a statistically significant relationship between the age of the ship and the reasons for the detention (Chi-square = 13,558; $p < 0,05$). Mejia Jr et al. (2010) found in their study that the rate of retention was higher in ships aged 25 and over. In a study that was carried out by Şanlıer, (2020) it was found that the main factor causing the increase of detentions and deficiency numbers was the age of vessel. Tsou (2019) discovered in his research that ships under inspection with a ship age of more than 25 years accounted for a large fraction of the detention vessels.

Table 2. Detention causes and totals by ship age

Ship Age	Reasons of Detention*										Total
	CD	SC	ES	FS	AL	WLC	PAM	PP	ISM	TB	
0-10	9	1	24	20	1	2	5	5	19	8	94
11-20	15	8	55	44	2	14	12	10	25	17	202
21-30	36	21	71	62	5	21	24	4	41	21	306
31-40	116	53	129	127	13	43	30	33	72	39	655
41+	30	21	44	41	4	19	9	4	23	20	215
Total	206	104	323	294	25	99	80	56	180	105	1472

*Certification and Documentations (CD), Structural Conditions (SC), Emergency Systems (ES), Fire Safety (FS), Alarms (AL), Working and Living Conditions (WLC), Propulsion and Auxiliary Machines (PAM), Pollution Prevention (PP), International Safety Management Code (ISM), Terms of Business (TB).

During the time period covered by the study, it was found that 850 of the ships with >3001 gross tonnage were detained for various reasons, while 75 of the ships with <1000 gross tonnage were detained. While certificates and documents are among the reasons for the detention of ships with <1000 gross tonnage, it was determined that ships with 1001-3000 and >3001 gross tonnage were mostly detained according to the substances included in the emergency systems. Alarms were determined to be the least common cause of detention in all ships that were detained (Table 3). An analysis of the variation in the reasons for detention depending on the ship's gross tonnage found a statistically significant association between the reasons for detention and the ship's gross tonnage. (Chi-square= 17.028; p<0.05). The CSIRO Mathematical and Information Sciences Unit in Australia (2014) conducted a thorough examination of inspection data. The key finding was that a ship's age was by far the most relevant factor in predicting ship quality. Ship type, ship inspection history, and, in certain cases, ship size all appeared to play a role. During an investigation, it was observed that ships with a gross tonnage of less than 8,500 tons made up a large portion of the detained vessels (Tsou, 2019).

Table 3. Reasons for and the number of detentions according to the ship's gross tonnage

Gross Tonnage	Reasons of Detention*										Total
	CD	SC	ES	FS	AL	WLC	PAM	PP	ISM	TB	
<1000	30	3	11	6	1	8	4	1	9	2	75
1001-3000	79	53	110	114	8	34	21	27	70	31	548
>3001	97	48	202	174	16	57	55	28	101	72	850
Total	206	104	323	294	25	99	80	56	180	105	1473

*Certification and Documentations (CD), Structural Conditions (SC), Emergency Systems (ES), Fire Safety (FS), Alarms (AL), Working and Living Conditions (WLC), Propulsion and Auxiliary Machines (PAM), Pollution Prevention (PP), International Safety Management Code (ISM), Terms of Business (TB).

In terms of the relation between vessel type and deficiencies, it was shown that general cargo vessels had the highest level of inadequacies (Table 4). While the number of general cargo ships detained in Black Sea ports was determined as 1311, it was determined that 58 tanker, 77 Ro-Ro and

18 container ships were detained in the same ports in the same time period. In a study examining the PSC data of the ships detained in the Black Sea ports, it was determined that general cargo ships were detained the most (Şanlıer, 2020). Additionally, it was discovered that tankers were typically detained according to the documentation and certificate, general cargo ships were generally detained according to the emergency systems, and Ro-Ro ships were generally detained according to the structural conditions. Result obtained from Kruskal Wallis test showed that there was no statistically significant relationship between the ship type and the reasons for the retention (Chi-square=3,256; $p>0.05$). Cariou and Wolff (2015) estimated the likelihood of a given type of ship having a high number of flaws using quantile regressions on count data.

Table 4. Reasons and numbers of detention by ship type

Type of Ship	Reasons of Detention*										Total
	CD	SC	ES	FS	AL	WLC	PAM	PP	ISM	TB	
General Cargo	183	83	298	265	23	91	65	49	162	91	1311
Tanker	13	8	5	10	-	3	5	2	7	5	58
Ro-Ro	9	12	14	12	1	5	8	4	5	7	77
Container	-	1	4	5	1	-	2	1	2	2	18
Others	1	-	2	2	-	-	-	-	4	-	9
Total	206	104	323	294	25	99	80	56	180	105	1473

*Certification and Documentation (CD), Structural Conditions (SC), Emergency Systems (ES), Fire Safety (FS), Alarms (AL), Working and Living Conditions (WLC), Propulsion and Auxiliary Machines (PAM), Pollution Prevention (PP), International Safety Management Code (ISM), Terms of Business (TB).

Classification societies certify that the construction of a vessel comply with relevant standards and carry out regular surveys in service to ensure continuing compliance with the standards and the safety of life and property at sea and to prevent marine pollution (McDorman, 2000). According to the classification societies the ships classified by the Japanese Classification Society (Class NK) were detained the most (180) (Table 5). This is followed by the ships classified by the Russian Class Society (RS) with 127 ships and by the Ukrainian Class Society (SRU) with 108 ships. 47 of the ships classified by Turk Loydu were found to be detained in Black Sea ports. The deficiency of 57 ships detained by the Japanese Classification Society (Class NK) was related to emergency systems and 27 of them related fire safety clause. Ships classified by Turk Loydu, on the other hand, were detained in accordance with the maximum fire safety clause. Following the investigation, it was shown that there was a statistically significant connection between the classification society for the ships and the causes of their detention (Chi-square= 38.497; $p<0.05$). Knapp and Velden (2009) emphasized discrepancies between the various PSC regimes, particularly the increased emphasis of Paris MOU members on issues linked to stability, structure, or safety.

Table 5. Reasons and numbers of being held according to the ship class organization

Class Organization	Reasons of Detention*										Total
	CD	SC	ES	FS	AL	WLC	PAM	PP	ISM	TB	
Turk Loydu	4	3	7	9	2	5	3	2	8	4	47
ASIA Classification Society	2	3	-	2	-	1	1	-	3	-	12
Bulgarian Register of Shipping	19	8	20	16	2	8	6	5	14	5	104
Bureau Veritas	8	4	25	15	1	3	10	3	13	12	94
Columbus American Register	4	2	-	3	-	1	-	2	2	-	14
Italian Naval Register	2	1	7	5	1	2	2	-	4	1	25
Polish Register of Shipping	3	2	8	10	1	-	-	1	5	4	34
Phoenix Register of Shipping	12	8	18	17	3	5	6	3	6	7	85
Nippon Kaiji Kyokai	21	9	57	38	2	10	11	3	22	7	180
National Shipping Adjuster Inc.	5	2	7	2	-	1	-	1	-	-	18
Mediterranean Shipping Register	2	3	4	3	-	1	1	1	1	1	17
Maritime Lloyd Ltd, Georgia	-	-	5	3	1	-	-	-	2	1	12
Macosnar Corporation	2	2	3	8	1	3	-	-	2	1	22
Lloyd's Register	1	1	13	7	1	3	3	3	4	6	42
Maritime Bureau of Shipping	2	1	2	3	-	-	1	2	1	1	13
Maritime Lloyd (ML)	8	8	8	6	-	3	2	3	7	5	50
Isthmus Bureau of Shipping, S.A.	2	2	2	6	-	2	1	1	-	1	17
International Register of Shipping	4	3	6	8	1	1	2	-	3	7	35
International Naval Surveys Bureau	3	3	12	16	1	4	1	-	6	6	52
Indian Register of Shipping	2	2	3	3	-	-	1	-	-	2	13
Dromon Bureau of Shipping	17	3	25	23	1	6	4	2	17	7	105
DNV GL AS Class	3	-	7	5	1	2	3	3	3	1	28
Cosmos Marine Bureau Inc.	6	-	5	5	-	-	1	2	3	2	24
Russian Maritime Register of Shipp.	15	11	28	19	-	15	6	7	21	5	127
Shipping Register of Ukraine	17	10	16	25	1	6	5	6	12	10	108
American Bureau of Shipping	2	1	3	3	-	2	-	1	3	1	16
Venezuelan Register of Shipping	2	3	8	4	-	5	3	-	4	3	32
Total	168	95	299	264	20	89	73	51	166	100	1326

*Certification and Documentations (CD), Structural Conditions (SC), Emergency Systems (ES), Fire Safety (FS), Alarms (AL), Working and Living Conditions (WLC), Propulsion and Auxiliary Machines (PAM), Pollution Prevention (PP), International Safety Management Code (ISM), Terms of Business (TB).

Table 6 shows the breakdown of the detained ships by the nations that the ports are located in. It was seen that the highest number of detention (462) occurred in Russian ports. Additionally, it was discovered that 123 ships were arrested in Turkish ports compared to 400 ships detained in Romanian ports. The reasons for detention differ according to the countries. The highest rate of deficiencies for detention made by Bulgaria, which is an EU member of the memorandum, was working conditions. Ships in Georgian ports were detained mostly due to certificate and documentation deficiencies and in Turkish, Romanian and Russian ports due to deficiencies in security systems. In contrast to other nations, Ukraine, one of those with a high number of detentions, has made the most detentions due to poor living and working conditions. According to the Kruskal Wallis test results, the relationship between the country that decided to arrest the ship and the ship's arrest was important (Chi-square=28,062; $p < 0.05$). Similar to these research findings, it was stated by Knapp and Frances (2007) that the probabilities of arresting ships differed according to the port state that controls them. On the other

hand, Cariou et al. (2008) underlined that the age of the ship, the classification society, and the port state that conducted the inspection were the most frequent causes for the detention of ships.

Table 2. Reasons for and the total number of detentions by countries

Country	Reasons of Detention*										Total
	CD	SC	ES	FS	AL	WLC	PAM	PP	ISM	TB	
Bulgaria	20	6	6	21	2	1	9	1	17	25	108
Georgia	39	3	20	16	12	-	5	9	22	-	127
Romania	71	14	110	58	5	12	5	9	107	9	400
Russia	26	41	137	116	4	2	37	14	16	69	462
Türkiye	19	16	32	23	-	10	8	9	6	-	123
Ukraine	31	24	18	60	2	74	16	14	12	2	253
Total	206	104	323	294	25	99	80	56	180	105	1473

*Certification and Documentations (CD), Structural Conditions (SC), Emergency Systems (ES), Fire Safety (FS), Alarms (AL), Working and Living Conditions (WLC), Propulsion and Auxiliary Machines (PAM), Pollution Prevention (PP), International Safety Management Code (ISM), Terms of Business (TB).

4. Conclusions and Recommendations

According to the findings obtained in the study, a statistically significant relationship was found between the flag of the ships subject to port state control and the reasons for their detention. It was discovered that Panama was the flag nation that was subjected to the detention process the most. This might be attributed to the fact that the Panama State provided procedures and documentation assistance to the ships flying its flag. It was discovered that the emergency fire pump, emergency lights, fire apparatus in the fire safety system, and a lack of maintenance supplies were the main reasons the ships were detained. These situations reveal the need for planned maintenance of ships and more efficient implementation of the International Safety Management Code (ISM). Accordingly, the flag states should carry out more effective inspections in order to give up the easy flag preferences of the ship owners and to take all kinds of measures in terms of life, property and environmental safety at sea.

The fact that there was a significant relationship between the age of the ship and the reasons for the arrest, according to the machinery findings, the ships between the ages of 31-40 were the most affected, and the older ships were problematic in this regard, thus reducing the average age of the ship by the ship-owners. It was seen that it would be important for the flag state to support this issue with financial support and the port state with strict controls. The Maritime Administrations will not allow ships under their own flags, above a certain age, to carry out transportation, especially in international waters, which will reduce the average age of ships in the world and prevent possible accidents.

According to this study, the majority of the ships that berthed at Black Sea ports had a gross tonnage of 3001 or more, which led to the conclusion that these ships were subject to more detention in Black Sea ports. The statistically significant difference between the classification societies and the reasons for retention may be due to the preference of ship owners for easy flag and classification societies. In particular, expanding the scope of the maximum requirements to be determined by the International Maritime Organization (IMO) for all classification societies of the member countries on an international scale will make the concept of easy class less effective.

When the ship detaining were compared to the countries where port state controls were conducted, according to the analysis, Russian ports saw the most detaining, and there was a substantial correlation between the reasons for detention and the nations that the detention ports were located in. The reason why the detention of ships in Russian ports was more common could be considered as the fact that this country attached more importance to port state inspection and had an inspection specialist in each port. Port state controls need to be established and institutionalized as a separate unit within the maritime authorities. Thus, both compliance with current developments and more effective inspection of ships will be ensured. Accordingly, port state inspections should be carried out more frequently and more sensitively in states subject to the Black Sea MOU, and the qualifications and numbers of port state inspection experts should be increased. It is clear that it would be beneficial to carry out studies to create awareness in all relevant persons and organizations that matters related to life, property and the environment are of higher priority than economic concerns.

The study discovered that there was no significant association between the type of ship, which was one of the factors utilized in this study, and the reasons for the eclipse analyzed.

Authors' Contributions

All authors contributed equally to the study.

Statement of Conflicts of Interest

There is no conflict of interest between the authors.

Statement of Research and Publication Ethics

The author declares that this study complies with Research and Publication Ethics.

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