

## A Comparative Study in Thrombocytopenia Induced By Dengue Fever or Viral Fever between Kiwi and Guava – A Randomized Clinical Trial

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### ABSTRACT:

**Introduction:** Thrombocytopenia is the major sign of dengue fever; many times patients require ICU admission when platelet count severely goes down in view of bleeding tendency.

**Aim:** To compare the effect of kiwi and guava in thrombocytopenia induced by dengue fever or any other viral fever.

**Methods and Materials:** A randomized clinical trial performed at Vishwaraj Hospital Pune, Maharashtra, India from July 2022 to September 2022 after registration done under the Clinical Trials Registry- India with clinical trial registration number CTRI/2022/07/043922 & approval by Institutional Ethics Committee. 100 thrombocytopenia patients induced by dengue selected by randomization method, in which 50 patients in kiwi group who received green kiwi fruit and 50 patients in guava group who received white flesh guava fruit.

**Results and Discussions:** There are 5 comparisons of interest. Comparative statistical analysis done to check any significant difference in platelet count and days required for recovery in between kiwi and guava group. The test used was 't' test for two independent samples. Level of significance is less than 0.05 ( $p < 0.05$ ). Analysis suggested that there was only increasing tendency in guava group while at first decreasing tendency and then increasing tendency of platelet count in kiwi group. The early recovery is significant in guava group compared to kiwi group at significance level 0.05 ( $p < 0.05$ ).

**Conclusion:** This study may concluded that in thrombocytopenia patients which is induced by dengue fever or any other viral fever guava fruit is better than kiwi fruit to increase in platelet count and for early recovery too.

**Keywords:** dengue, guava, kiwi, low platelet count, thrombocytopenia, viral fever.

### INTRODUCTION:

Dengue virus is transmitted by the *Aedes aegypti* mosquito and characterized by four antigenically related serotypes (Dengue 1–4), where infection with one serotype provides life-long immunity to that particular serotype but not to other serotypes. Clinical

presentations of dengue ranges from subclinical infection to severe hemorrhagic disease, Dengue fever is characterized by sudden onset of high fever, chills, severe headache (mostly frontal or retro-ocular), skin rash and general malaise. Two distinct clinical entities, dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), have been poorer outcomes, with mortality rates approaching 5% (1). Since last 30 years, dengue fever has dramatically expanded its geographical range and shortened its epidemic cycle in many places. According to the World Health Organization (WHO), dengue is endemic in over 100 countries and approximately two-fifths of the world's population is currently at risk for dengue fever with an estimated 50 million infections annually(2,3). DHF is a leading cause of serious illness and death among children in some Asian countries (4). Among the estimated 2.5 billion people at risk globally for dengue, about 1.8 billion almost 70% located in in Asia Pacific countries(3,5)

A symptomatic episode includes a febrile phase (with fever of at least 38.5°C), a critical phase and a recovery or convalescent phase. However, some dengue patients present with symptoms like fatigue, depression, and weight loss after the recovery phase, a possibility acknowledged by the World Health Organization (WHO) since 1997(6) . Thrombocytopenia is a cardinal sign of severe dengue virus infection and platelet levels are lower in dengue virus infected patients compared to other febrile illnesses. Severe thrombocytopenia  $<20 \times 10^9/L$  occurs frequently in hospitalized dengue patients, and is associated with prolonged admission, plasma leakage and the presence of clinical warning signs. (7)

In dengue fever diet therapy is very helpful in recovering from dengue, good nutritional status, improved appetite and balanced electrolytes (4).

A retrospective study was carried out from November 2017 to April 2018 with the objective to see the effect of vitamin C in the management of Dengue fever in the tertiary care hospitals of selected three states of India (Tamil Nadu, Kerala, and Madhya Pradesh), the patients who were administered with Vitamin C had a greater percentage increase in their platelet count and a shorter duration of hospital stay. Study indicates that there is an association between Vitamin C intake and length of hospital stay (8) In dengue fever goat milk and milk products are very helpful because they directly modulate the human immune system, thus dengue fever can be managed with goat milk and its products(9)

### **How fruits play supportive role in natural remedies of dengue:**

Fruits are rich source of vitamins, minerals and antioxidants. Fruits keep persons healthy and protects from various diseases by enhancing the immunity of body against various diseases as fruits are rich source of phytochemicals (biologically active chemicals e.g. antioxidants) too. Fruits have generous amount of water thus it keeps body hydrated which is very much essential during dengue fever treatment. Some fruits are rich source of vitamins like vitamin A, C, D, K, B-9, B-12, minerals like Iron, and antioxidants which helps in increasing platelets count.

Now a days, kiwi fruit and dragon fruits are recommended during viral infections, as these fruits will help in cure the viral infections, but being a high market value of the kiwi fruit and dragon fruit, these fruits are less affordable for poor families. Higher rates of these two fruits might be due to these fruits are imported from other countries to the Indian market and less availability in the market, which results in to higher price in the market. Indian Gooseberry (amla) and guava (peru) are very good source of vitamin C, which is much more than kiwi fruit and dragon fruit, also these fruits are local fruit so they can easily available at all places, also cheaper than kiwi and dragonfruit. These fruits are very good source of vitamins and minerals, which helps in increasing platelets counts, boosting immunity and hydrating the body and finally helps in speedy recovery during dengue or other fever infection.

Still it is under investigation that curing of dengue fever solely with papaya, dragon fruit or kiwi fruit, so proper food diet enriched with all fruits and vegetables (whatever available and not only dragon fruit or kiwi fruit) is necessary for speedy recovery of the dengue virus infected person (10).

The peel of guava has higher values of ascorbic acid, total protein and phenolic compounds than the pulp. The white-fleshed guavas have higher levels of total soluble solids, phenolic compounds and ascorbic acid content than the pink-fleshed guavas (11)

Nutritive Values of green Kiwi(12)and white flesh Guava(13)per100 gms										
Name	Energy (kcal)	CHO (gms)	Pro (gms)	Fats (gms)	Moisture (gms)	Total Fibre (gms)	β-carotene (µg)	K <sup>+</sup> (mg)	B9 (µg)	Total Ascorbic acid (mg)
Kiwi	61	14	1.1	0.52	83	3	52	300	25	92
Guava	32	5.13	1.4	0.32	83	8.6	300	283	30	214

As we compared kiwi and guava fruits, their nutritive values are as follows;

Thus we have seen nutrition plays an important role in thrombocytopenia, relief from symptoms. Hence in current study we asked to eat guava a local fruit for Maharashtra to one group (n=50), We have been made two groups of thrombocytopenia (low platelet count) patients caused by dengue fever or any other viral fever, one group received green kiwi (Chinese gooseberry) and other group received white flesh guava. Then we checked which group's platelet count has increasing or decreasing tendency by complete blood count test daily. Also how many days required to be recovered. Both groups received same treatment and followed same diet chart except one group received kiwi and other group received guava.

### 1.1.Objective

To compare the effect of kiwi and guava in thrombocytopenia induced by dengue fever or any other viral fever.

## MATERIALS AND METHODS:

### 2.1. Study Design

Interventional / Experimental study with clinical trial to increase the platelet count in dengue fever and other viral fever.

### 2.2. Ethical approval

This study is registered under the Clinical Trials Registry- India (CTRI), before enrollment of patients with CTR Number - CTRI/2022/07/043922.

Appropriate ethical approval was obtained from the Vishwaraj Hospital Ethics Committee (Registration number- ECR/1138/Inst/MH/2018/RR-21), the study protocol, Consent form, Assent form was designed and approved by the Institutional Ethics Committee before the start of the study and all subjects of study group had given written, informed consent (In English, Marathi and Hindi language).

### 2.3. Selection of samples

100 patients of thrombocytopenia induced by dengue fever or any other viral fever were selected by Randomization method in which, 50 patients were given green kiwi fruit and 50 patients were given white flesh guava fruit, out of those 10 patients were paediatric patients, 5 in a kiwi group and 5 in a guava group. Diagnosis of thrombocytopenia was confirmed by complete blood count report.

All 100 patients were hospitalized patients at Vishwaraj Hospital and Shrigiri Hospital Pune, Maharashtra, India.

Patients were asked to eat either green kiwi or white flesh guava on the day 1 of admission after taking signature on consent form and after giving all written and verbal information about kiwi and guava.

**Dose :-** 100 gms - 300 gms of green kiwi for first group and white flesh guava for second group depends on appetite of patients.

All patients were received same treatment, followed same diet but only the difference was one group received kiwi and other group received guava, After consuming kiwi and guava daily follow up had been taken from 2<sup>nd</sup> day till patient gets discharged.

#### 2.3.1. Inclusion criteria

1. Confirmed diagnosis of thrombocytopenia by complete blood test of dengue patients or any other viral fever patients by blood test (Complete blood Count)

#### 2.3.2. Exclusion criteria: None

### 2.3.3. Statistical analysis:

#### Statistical tools used -

There are five comparisons of interest in the study

A] Comparison of Platelet count within Kiwi Group

B] Comparison of Platelet count within Guava Group

C] Comparison of Platelet count between Kiwi & Guava Groups

D] Comparison of Increase in Platelet count between Kiwi & Guava Groups

E] Comparison of Number of days for recovery between Kiwi & Guava Groups

The variable for comparisons A, B & C is platelet count which is continuous. The variable for comparison D is increase in platelet count with respect to the first day which is also continuous. The variable for comparison E is the number of days for recovery which is also continuous & discrete more specifically. The statistical tools used are parametric tests.

Whenever there is paired observation (for ex: Day1 & Day2; Day1 & Day3;... so on) within groups that is for comparisons A & B, paired t test is being used. Whenever there is comparison between two groups that is for comparisons C, D & E, t test for two independent samples is being used.

## RESULTS AND DISCUSSIONS:

This clinical trial performed on 100 hospitalized patients of thrombocytopenia induced by dengue fever or any other viral fever. All participants were selected by randomized method with confirmed diagnosis of thrombocytopenia that is low platelet count by blood test. Two groups were made in which 50 patients were asked to eat green kiwi and 50 patients were asked to eat white flesh guava on the first day of admission. All patients were admitted within 2<sup>nd</sup> to 4<sup>th</sup> day of fever with complaining of nausea, vomiting, anorexia, body ache, headache along with fever. Same diet chart had been provided to both groups. All of them received same line of treatment for fever and thrombocytopenia. Only one difference was in type of fruit they were eating that is either kiwi or guava.

Normal values of platelet count – 150000 to 450000 per microliter (mcL)

Platelet counts are predictive along with recovery parameter of Dengue Fever /Dengue Hemorrhagic Fever /Dengue Shock Syndrome.(14) Thrombocytopenia is defined as a platelet count  $< 150 \times 10^3$  per  $\mu\text{L}$ .(15)

There was wide range of age group in this study, as mentioned in Table 1 we were having patients from 10 years to 73 years old.

The detailed results with the frequency of distribution and statistical test with discussions are present below,

### 3.1. Age group

Age is a significant factor in defining severity of disease after primary dengue virus infection, adults are more likely to have clinical dengue than young children(16).

**Table 1:** The frequency distribution of patients according to Age group is as given below

Age in Years	Kiwi	%	Guava	%	Total	%
10 to 20	6	12.0	11	22.0	17	17.0
20 to 30	15	30.0	12	24.0	27	27.0
30 to 40	15	30.0	9	18.0	24	24.0
40 to 50	2	4.0	5	10.0	7	7.0
50 to 60	5	10.0	7	14.0	12	12.0
60 to 70	4	8.0	4	8.0	8	8.0
70 to 80	3	6.0	2	4.0	5	5.0
Total	50	100.0	50	100.0	100	100.0

### 3.2. Platelet Count (Day 1)

Thrombocytopenia is one of the significant indicator for dengue severity and it's prevalence in dengue is high that is 69% from mild to severe. There is a negative correlation between platelet count and clinical complications, signifying that lower the platelet count more the complications are and their respective severity as patients with lower platelet count have higher chances of non-hemorrhagic complications(17)

**Table 2:** The frequency distribution of patients according to Platelets (Day 1) is as given below.

Platelet count (Day 1)	Kiwi	%	Guava	%	Total	%
0 to 20k	1	2.0	12	24.0	13	13.0
20k to 40k	6	12.0	14	28.0	20	20.0
40k to 60k	3	6.0	7	14.0	10	10.0
60k to 80k	5	10.0	4	8.0	9	9.0
80k to 100k	9	18.0	5	10.0	14	14.0
100k to 120k	10	20.0	3	6.0	13	13.0
120k to 140k	6	12.0	4	8.0	10	10.0
140k & above	10	20.0	1	2.0	11	11.0
Total	50	100.0	50	100.0	100	100.0

In guava group 52% patients were admitted whose platelet count were below 40 k on day 1.

Day wise platelet count in each group is given in following tables from table 3 to table 14.

### 3.3. Platelet count (Day 2)

**Table 3:**The frequency distribution of patients according to Platelets (Day 2) is as given below.

Platelet count (Day 2)	Kiwi	%	Guava	%	Total	%
0 to 20k	3	6.0	7	14.0	10	10.0
20k to 40k	7	14.0	13	26.0	20	20.0
40k to 60k	5	10.0	9	18.0	14	14.0
60k to 80k	9	18.0	6	12.0	15	15.0
80k to 100k	9	18.0	4	8.0	13	13.0
100k to 120k	10	20.0	5	10.0	15	15.0
120k to 140k	6	12.0	5	10.0	11	11.0
140k & above	1	2.0	1	2.0	2	2.0
Total	50	100.0	50	100.0	100	100.0

### 3.4. Platelet Count (Day 3)

Severe thrombocytopenia, plasma leakage, acute hepatitis is identified subgroups of adult dengue patients with increased mortality rates. Major symptoms reported by the patients like pain in abdomen, cough or diarrhea are significantly associated with the development of severe manifestations and should be considered as warning signs(18)

**Table 4:**The frequency distribution of patients according to Platelets (Day 3) is as given below

Platelet Count (Day 3)	Kiwi	%	Guava	%	Total	%
0 to 20k	4	8.0	4	8.0	8	8.0
20k to 40k	12	24.0	11	22.0	23	23.0
40k to 60k	3	6.0	6	12.0	9	9.0
60k to 80k	8	16.0	7	14.0	15	15.0
80k to 100k	17	34.0	8	16.0	25	25.0
100k to 120k	3	6.0	2	4.0	5	5.0
120k to 140k	2	4.0	9	18.0	11	11.0
140k & above	1	2.0	3	6.0	4	4.0
Total	50	100.0	50	100.0	100	100.0

### 3.5. Platelet count (Day 4)

Rarely there are ocular complications associated with dengue fever, but may result in permanent visual impairment.(19) Maculopathy and hemorrhage are the main ocular complications of dengue fever, these usually present at the start of convalescence phase(20)

**Table 5:** The frequency distribution of patients according to Platelets (Day 4) is as given below.

Platelet Count (Day 4)	Kiwi	%	Guava	%	Total	%
0 to 20k	5	10.0	1	2.0	6	6.0
20k to 40k	11	22.0	7	14.0	18	18.0
40k to 60k	8	16.0	8	16.0	16	16.0
60k to 80k	7	14.0	5	10.0	12	12.0
80k to 100k	9	18.0	9	18.0	18	18.0
100k to 120k	9	18.0	3	6.0	12	12.0
120k to 140k	0	0.0	5	10.0	5	5.0
140k & above	1	2.0	12	24.0	13	13.0
Total	50	100.0	50	100.0	100	100.0

### 3.6. Platelet Count (Day 5)

**Discharge criteria from both hospitals:** When patients from any group recovered from their symptoms means when asymptomatic that is no nausea, vomiting, improved appetite and no any other health complaints along with platelet count more than 100 k then patients discharged from hospital.

**Table 6:** The frequency distribution of patients according to Platelets (Day 5) is as given below.

Platelet Count (Day 5)	Kiwi	%	Guava	%	Total	%
0 to 20k	5	10.0	1	2.0	6	6.0
20k to 40k	9	18.0	1	2.0	10	10.0
40k to 60k	11	22.0	7	14.0	18	18.0
60k to 80k	7	14.0	4	8.0	11	11.0
80k to 100k	7	14.0	5	10.0	12	12.0
100k to 120k	5	10.0	7	14.0	12	12.0
120k to 140k	1	2.0	3	6.0	4	4.0
140k & above	3	6.0	9	18.0	12	12.0
Discharged	2	4.0	13	26.0	15	15.0
Total	50	100.0	50	100.0	100	100.0

Majority patients that is 26 % (n=13) from guava group started to getting discharged at day 5.

### 3.7. Platelet Count (Day 6)

Dengue has a wide range of neurological complications such as encephalitis, myositis, myelitis, Guillain–Barré syndrome and mononeuropathies, out of these encephalopathy is the most common reported complication.(21)



**Table 7:** The frequency distribution of patients according to Platelets (Day 6) is as given below.

Platelet Count (Day 6)	Kiwi	%	Guava	%	Total	%
0 to 20k	4	8.0	0	0.0	4	4.0
20k to 40k	9	18.0	2	4.0	11	11.0
40k to 60k	11	22.0	3	6.0	14	14.0
60k to 80k	4	8.0	4	8.0	8	8.0
80k to 100k	4	8.0	4	8.0	8	8.0
100k to 120k	3	6.0	2	4.0	5	5.0
120k to 140k	3	6.0	1	2.0	4	4.0
140k & above	4	8.0	6	12.0	10	10.0
Discharged	8	16.0	28	56.0	36	36.0
Total	50	100.0	50	100.0	100	100.0

56 % (n=28) patients discharged from guava group till day 6, while only 16 % (n=8) patients from kiwi group discharged till day 6.

### 3.8. Platelet count (Day 7)

**Table 8:** The frequency distribution of patients according to Platelets (Day 7) is as given below.

Platelet count (Day 7)	Kiwi	%	Guava	%	Total	%
0 to 20k	4	8.0	0	0.0	4	4.0
20k to 40k	6	12.0	0	0.0	6	6.0
40k to 60k	6	12.0	1	2.0	7	7.0
60k to 80k	6	12.0	2	4.0	8	8.0
80k to 100k	6	12.0	7	14.0	13	13.0
100k to 120k	1	2.0	3	6.0	4	4.0
120k to 140k	3	6.0	1	2.0	4	4.0
140k & above	0	0.0	2	4.0	2	2.0
Discharged	18	36.0	34	68.0	52	52.0
Total	50	100.0	50	100.0	100	100.0

68 % (n=34) patients discharged from guava group till day 7, while only 36 % (n=18) patients from kiwi group discharged till day 7. Significant number of patients discharged from guava group.

### 3.9. Platelet Count (Day 8)

**Table 9:** The frequency distribution of patients according to Platelets (Day 8) is as given below.

Platelet Count (Day 8)	Kiwi	%	Guava	%	Total	%
0 to 20k	3	6.0	0	0.0	3	3.0
20k to 40k	2	4.0	0	0.0	2	2.0
40k to 60k	4	8.0	0	0.0	4	4.0
60k to 80k	3	6.0	1	2.0	4	4.0
80k to 100k	7	14.0	2	4.0	9	9.0
100k to 120k	3	6.0	2	4.0	5	5.0
120k to 140k	3	6.0	5	10.0	8	8.0
140k & above	1	2.0	2	4.0	3	3.0
Discharged	24	48.0	38	76.0	62	62.0
Total	50	100.0	50	100.0	100	100.0

76 % (n=38) patients discharged from guava group till day 8, while only 48 % (n=24) patients from kiwi group discharged till day 8.

### 3.10. Platelet Count (Day 9)

**Table 10:** The frequency distribution of patients according to Platelets (Day 9) is as given below.

Platelet Count (Day 9)	Kiwi	%	Guava	%	Total	%
0 to 20k	1	2.0	1	2.0	2	2.0
20k to 40k	3	6.0	0	0.0	3	3.0
40k to 60k	3	6.0	0	0.0	3	3.0
60k to 80k	1	2.0	0	0.0	1	1.0
80k to 100k	4	8.0	1	2.0	5	5.0
100k to 120k	4	8.0	3	6.0	7	7.0
120k to 140k	0	0.0	1	2.0	1	1.0
140k & above	3	6.0	2	4.0	5	5.0
Discharged	31	62.0	42	84.0	73	73.0
Total	50	100.0	50	100.0	100	100.0

84 % (n=42) patients discharged from guava group till day 9 and 62 % (n=31) patients from kiwi group discharged till day 9.

### 3.11. Platelet Count (Day 10)

**Table 11:** The frequency distribution of patients according to Platelets (Day 10) is as given below.

Platelet Count (Day 10)	Kiwi	%	Guava	%	Total	%
0 to 20k	1	2.0	0	0.0	1	1.0
20k to 40k	2	4.0	0	0.0	2	2.0
40k to 60k	0	0.0	0	0.0	0	0.0
60k to 80k	2	4.0	0	0.0	2	2.0
80k to 100k	3	6.0	0	0.0	3	3.0
100k to 120k	1	2.0	1	2.0	2	2.0
120k to 140k	0	0.0	2	4.0	2	2.0
140k & above	2	4.0	1	2.0	3	3.0
Discharged	39	78.0	46	92.0	85	85.0
Total	50	100.0	50	100.0	100	100.0

92 % (n=46) patients discharged from guava group till day 10 and 78 % (n=24) patients from kiwi group discharged till day 10.

### 3.12. Platelet Count (Day 11)

**Table 12 :**The frequency distribution of patients according to Platelets (Day 11) is as given below.

Platelet Count (Day 11)	Kiwi	%	Guava	%	Total	%
0 to 20k	0	0.0	0	0.0	0	0.0
20k to 40k	0	0.0	0	0.0	0	0.0
40k to 60k	2	4.0	0	0.0	2	2.0
60k to 80k	1	2.0	0	0.0	1	1.0
80k to 100k	2	4.0	0	0.0	2	2.0
100k to 120k	0	0.0	0	0.0	0	0.0
120k to 140k	0	0.0	0	0.0	0	0.0
140k & above	1	2.0	3	6.0	4	4.0
Discharged	44	88.0	47	94.0	91	91.0
Total	50	100.0	50	100.0	100	100.0

94 % (n=47) patients discharged from guava group till day 10 and 88 % (n=44) patients from kiwi group discharged till day 11. Only 3 patients from guava group did not discharge but they had platelet count more than 140 k.

### 3.13. Platelet Count (Day 12)

**Table 13:**The frequency distribution of patients according to Platelets (Day 12) is as given below.

Platelet Count (Day 12)	Kiwi	%	Guava	%	Total	%
0 to 20k	0	0.0	0	0.0	0	0.0
20k to 40k	0	0.0	0	0.0	0	0.0
40k to 60k	1	2.0	0	0.0	1	1.0
60k to 80k	1	2.0	0	0.0	1	1.0
80k to 100k	0	0.0	0	0.0	0	0.0
100k to 120k	0	0.0	0	0.0	0	0.0
120k to 140k	1	2.0	0	0.0	1	1.0
140k & above	0	0.0	0	0.0	0	0.0
Discharged	47	94.0	50	100.0	97	97.0
Total	50	100.0	50	100.0	100	100.0

All admitted patients that is 100 % (n=50) patients discharged from guava group till day 12 and 94 % (n=47) patients from kiwi group discharged till day 12.

### 3.14. Platelet Count (Day 13)

**Table 14:**The frequency distribution of patients according to Platelets (Day 13) is as given below.

Platelet Count (Day 13)	Kiwi	%	Guava	%	Total	%
0 to 20k	0	0.0	0	0.0	0	0.0
20k to 40k	0	0.0	0	0.0	0	0.0
40k to 60k	0	0.0	0	0.0	0	0.0
60k to 80k	0	0.0	0	0.0	0	0.0
80k to 100k	0	0.0	0	0.0	0	0.0
100k to 120k	1	2.0	0	0.0	1	1.0
120k to 140k	0	0.0	0	0.0	0	0.0
140k & above	0	0.0	0	0.0	0	0.0
Discharged	49	98.0	50	100.0	99	99.0
Total	50	100.0	50	100.0	100	100.0

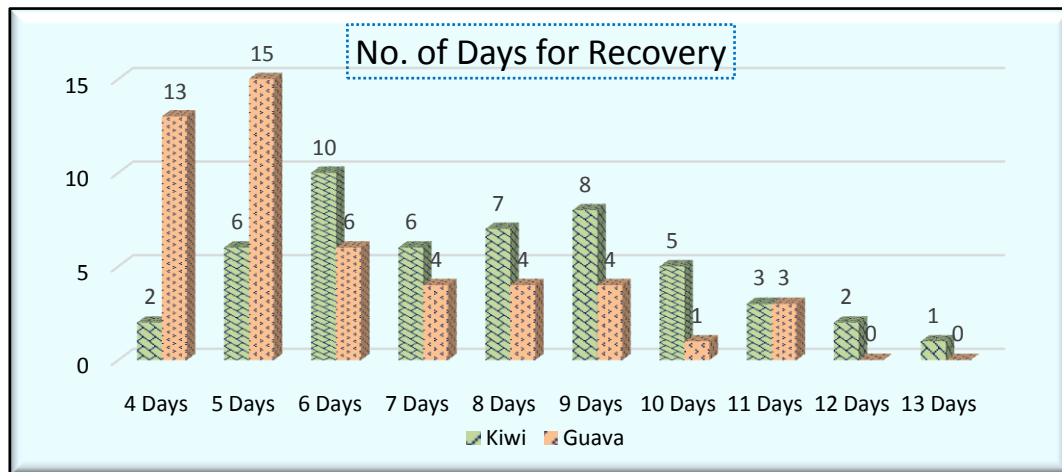
From kiwi group 49 patients discharged till day 13 and last 50<sup>th</sup> patients discharged on 14<sup>th</sup> day.

### 3.15. Number of Days for Recovery

Fruits like papaya, kiwi fruit, dragon fruit help in recovering viral diseases by hydrating body, increasing platelets counts, boosting immunity etc. then there are so many other fruits

available in the market which are rich source of vitamins, minerals and antioxidants, which helps in rehydrating body, boosting immunity and disease resistivity. Therefore, person who infected from dengue virus should take all the benefits of fruits in addition to papaya or kiwi fruit or dragon fruit(10)

In this study, majority patients 68 % (n=34) were recovered within 5 days in guava group, while in kiwi group only 16% were recovered within 5 days. (fig 1)



**Figure 1:** The frequency distribution of patients according to Number of Days for Recovery

**Aim**

To test that whether there is any significant difference in increase in platelet count and days required for recovery among both kiwi and guava groups.

The test used is ‘t’ test for two independent samples.

**3.16. Comparison of Platelet count within kiwi group:**

**Table 15:**The comparison of platelet counts of patients from day 2 onwards with day 1 within kiwi group is done by paired t test. The results are as follows.

**Calculation Tables:**

Paired Samples Statistics <sup>a</sup>					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Day 1	96620.00	50	42216.59	5970.33
	Day 2	77540.00	50	36155.68	5113.19
Pair 2	Day 1	96620.00	50	42216.59	5970.33
	Day 3	67140.00	50	33691.89	4764.75
Pair 3	Day 1	96620.00	50	42216.59	5970.33

Paired Samples Statistics <sup>a</sup>					
		Mean	N	Std. Deviation	Std. Error Mean
	Day 4	65580.00	50	35608.47	5035.80
Pair 4	Day 1	97437.50	48	41890.89	6046.43
	Day 5	63562.50	48	38078.81	5496.20
Pair 5	Day 1	93595.24	42	41415.24	6390.51
	Day 6	67095.24	42	45596.75	7035.73
Pair 6	Day 1	90562.50	32	42228.21	7464.96
	Day 7	61968.75	32	35455.09	6267.63
Pair 7	Day 1	90423.08	26	43720.18	8574.23
	Day 8	77000.00	26	40176.61	7879.28
Pair 8	Day 1	83578.95	19	45448.77	10426.66
	Day 9	84315.79	19	42461.82	9741.41
Pair 9	Day 1	75636.36	11	41850.38	12618.37
	Day 10	82272.73	11	46195.43	13928.45
Pair 10	Day 1	51666.67	6	29897.60	12205.65
	Day 11	83666.67	6	45142.74	18429.45
Pair 11	Day 1	41333.33	3	38017.54	21949.44
	Day 12	82666.67	3	34530.18	19936.01
Pair 12	Day 1	80000.00	1 <sup>b</sup>		
	Day 13	103000.00	1 <sup>b</sup>		
a. Groups = Kiwi					
b. The correlation and t cannot be computed because the sum of case weights is less than or equal to 1.					

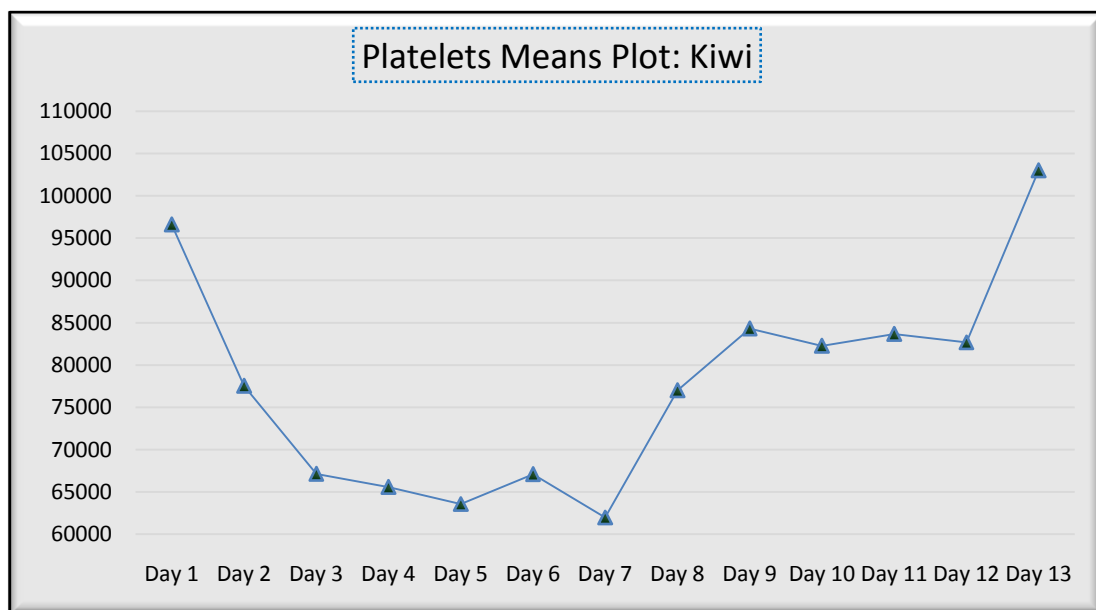
Paired Samples Test <sup>a</sup>							
		Paired Differences			t	df	P value (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Day 1 - Day 2	19080.00	21667.09	3064.19	6.227	49	.000
Pair 2	Day 1 - Day 3	29480.00	32594.13	4609.51	6.395	49	.000
Pair 3	Day 1 - Day 4	31040.00	40842.14	5775.95	5.374	49	.000
Pair 4	Day 1 - Day 5	33875.00	47014.99	6786.03	4.992	47	.000
Pair 5	Day 1 - Day 6	26500.00	57916.36	8936.69	2.965	41	.005
Pair 6	Day 1 - Day 7	28593.75	48607.62	8592.69	3.328	31	.002

Paired Samples Test <sup>a</sup>							
		Paired Differences			t	df	P value (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 7	Day 1 - Day 8	13423.08	49007.90	9611.24	1.397	25	.175
Pair 8	Day 1 - Day 9	-736.84	56310.49	12918.51	-.057	18	.955
Pair 9	Day 1 - Day 10	-6636.36	49966.53	15065.48	-.441	10	.669
Pair 10	Day 1 - Day 11	-32000.00	54424.26	22218.61	-1.440	5	.209
Pair 11	Day 1 - Day 12	-41333.33	44635.56	25770.35	-1.604	2	.250

a. Groups = Kiwi

The comparisons of platelet count of patients from day 2 onwards with day 1 are significant from Day 2 to Day 7. There is significant difference in platelet count of (Day 2 & Day 1); (Day 3 & Day 1); (Day 4 & Day 1); (Day 5 & Day 1); (Day 6 & Day 1); (Day 7 & Day 1). The comparisons of platelet count of patients from day 2 onwards with day 1 are not significant from Day 8 onwards. The platelet count of patients is nearly same on an average of (Day 8 & Day 1); (Day 9 & Day 1); (Day 10 & Day 1); (Day 11 & Day 1); (Day 12 & Day 1).

**Means Plot:**



**Figure 2:** The comparison of platelet counts of patients from day 2 onwards with day 1 within kiwi group.

There is gradual decrease in platelet count on an average up to day 7 then there is gradual increase up to day 13. This means in kiwi group there was decreasing tendency in first week followed by increasing tendency of platelet count.

**3.16. Comparison of Platelet count within guava group:**

**Table 16:**The comparison of platelet counts of patients from day 2 onwards with day 1 within Guava group is done by paired t test. The results are as follows.

**Calculation Tables:**

Paired Samples Statistics <sup>a</sup>					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Day 1	51880.00	50	40334.64	5704.18
	Day 2	60100.00	50	39916.88	5645.10
Pair 2	Day 1	51880.00	50	40334.64	5704.18
	Day 3	73360.00	50	41276.94	5837.44
Pair 3	Day 1	51880.00	50	40334.64	5704.18
	Day 4	93120.00	50	46737.93	6609.74
Pair 4	Day 1	41351.35	37	37103.62	6099.80
	Day 5	99324.32	37	44275.69	7278.88
Pair 5	Day 1	33954.55	22	33944.60	7237.01
	Day 6	151909.09	22	238310.90	50808.06
Pair 6	Day 1	26750.00	16	34564.91	8641.23
	Day 7	102875.00	16	31476.71	7869.18
Pair 7	Day 1	27250.00	12	39728.91	11468.75
	Day 8	116500.00	12	28624.53	8263.19
Pair 8	Day 1	34250.00	8	47993.30	16968.20
	Day 9	112075.00	8	44577.24	15760.44
Pair 9	Day 1	14250.00	4	14522.97	7261.49
	Day 10	136250.00	4	18481.97	9240.99
Pair 10	Day 1	17000.00	3	16462.08	9504.38
	Day 11	158333.33	3	1154.70	666.67
a. Groups = Guava					
b. The correlation and t cannot be computed because there are no valid pairs.					

Paired Samples Test <sup>a</sup>							
		Paired Differences			t	df	P value (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	Day 1 - Day 2	-8220.00	9074.05	1283.26	-6.406	49	.000
Pair 2	Day 1 - Day 3	-21480.00	20317.12	2873.27	-7.476	49	.000

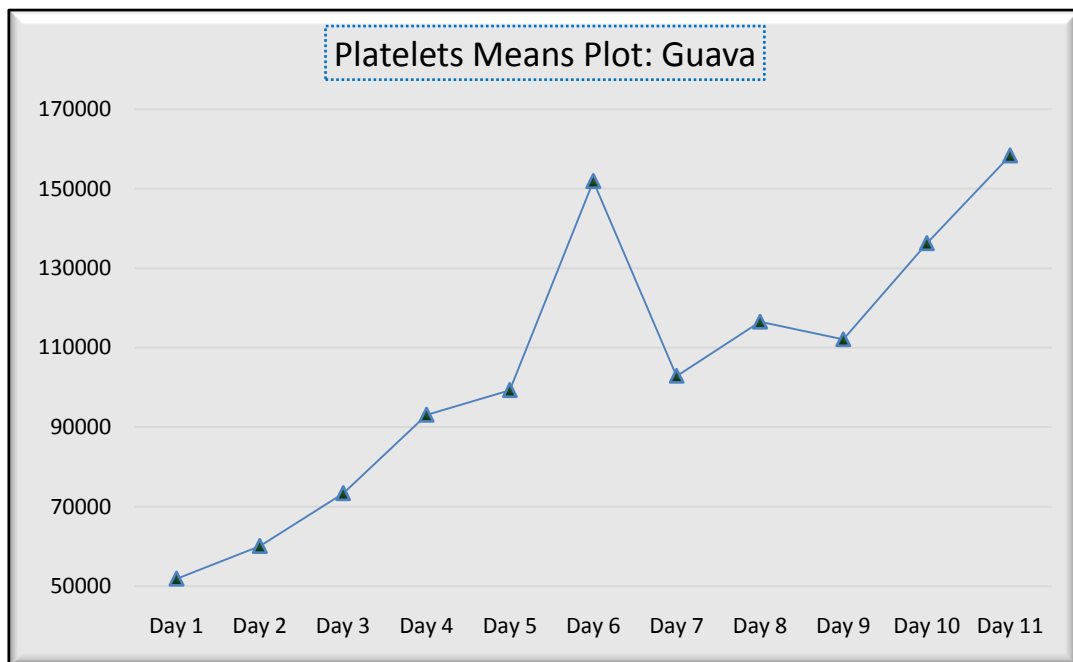


Paired Samples Test <sup>a</sup>							
		Paired Differences			t	df	P value (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 3	Day 1 - Day 4	-41240.00	30533.73	4318.12	-9.550	49	.000
Pair 4	Day 1 - Day 5	-57972.97	39850.06	6551.31	-8.849	36	.000
Pair 5	Day 1 - Day 6	-117954.55	236457.28	50412.86	-2.340	21	.029
Pair 6	Day 1 - Day 7	-76125.00	49071.21	12267.80	-6.205	15	.000
Pair 7	Day 1 - Day 8	-89250.00	56964.30	16444.18	-5.427	11	.000
Pair 8	Day 1 - Day 9	-77825.00	59474.02	21027.24	-3.701	7	.008
Pair 9	Day 1 - Day 10	-122000.00	32155.87	16077.94	-7.588	3	.005
Pair 10	Day 1 - Day 11	-141333.33	17616.28	10170.76	-13.896	2	.005

a. Groups = Guava

The comparisons of platelet count of patients from day 2 onwards with day 1 are significant from Day 2 to Day 11. There is significant difference in platelet count of (Day 2 & Day 1); (Day 3 & Day 1); (Day 4 & Day 1); (Day 5 & Day 1); (Day 6 & Day 1); (Day 7 & Day 1); (Day 8 & Day 1); (Day 9 & Day 1); (Day 10 & Day 1); (Day 11 & Day 1).

**Means Plot:**



**Figure 3:** The comparison of platelet counts of patients from day 2 onwards with day 1 within Guava group.

There is gradual increase in platelet count on an average up to day 11. In guava group there was no decreasing tendency of platelet count at any day, it shows only increasing tendency.

### 3.17. Comparison of Platelet count between kiwi and guava groups:

**Table 17:**The comparison of day wise platelet counts between two groups kiwi and guava is done by t test for two independent samples. The results are as follows.

#### Calculation Tables:

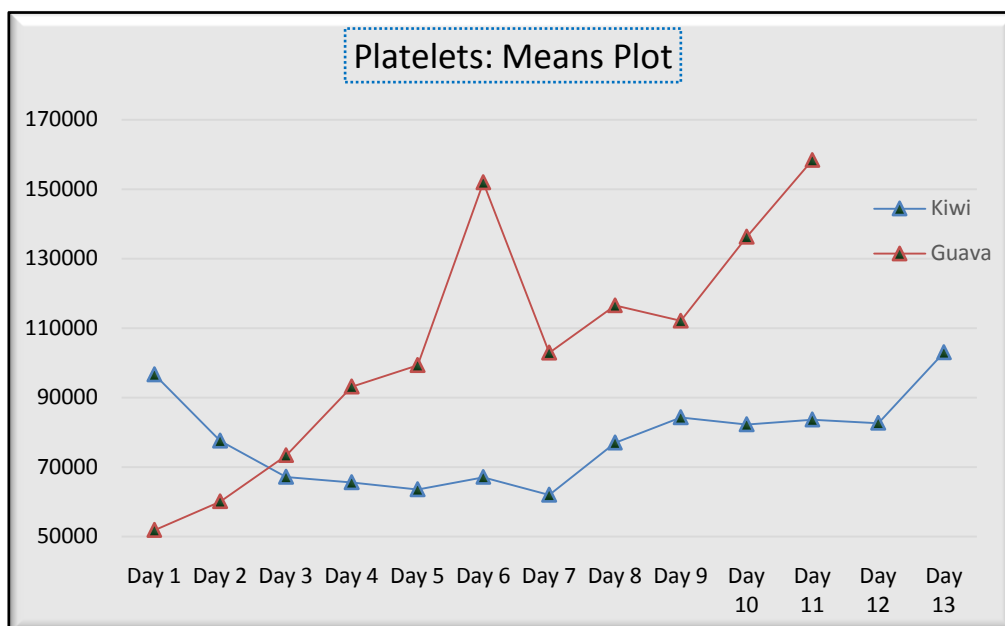
Group Statistics					
Groups		N	Mean	Std. Deviation	Std. Error Mean
Day 1	Kiwi	50	96620.00	42216.59	5970.33
	Guava	50	51880.00	40334.64	5704.18
Day 2	Kiwi	50	77540.00	36155.68	5113.19
	Guava	50	60100.00	39916.88	5645.10
Day 3	Kiwi	50	67140.00	33691.89	4764.75
	Guava	50	73360.00	41276.94	5837.44
Day 4	Kiwi	50	65580.00	35608.47	5035.80
	Guava	50	93120.00	46737.93	6609.74
Day 5	Kiwi	48	63562.50	38078.81	5496.20
	Guava	37	99324.32	44275.69	7278.88
Day 6	Kiwi	42	67095.24	45596.75	7035.73
	Guava	22	151909.09	238310.90	50808.06
Day 7	Kiwi	32	61968.75	35455.09	6267.63
	Guava	16	102875.00	31476.71	7869.18
Day 8	Kiwi	26	77000.00	40176.61	7879.28
	Guava	12	116500.00	28624.53	8263.19
Day 9	Kiwi	19	84315.79	42461.82	9741.41
	Guava	8	112075.00	44577.24	15760.44
Day 10	Kiwi	11	82272.73	46195.43	13928.45
	Guava	4	136250.00	18481.97	9240.99
Day 11	Kiwi	6	83666.67	45142.74	18429.45
	Guava	3	158333.33	1154.70	666.67
Day 12	Kiwi	3	82666.67	34530.18	19936.01
	Guava	0 <sup>a</sup>			
Day 13	Kiwi	1	103000.00		
	Guava	0 <sup>a</sup>			

Independent Samples Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	P value (2-tailed)
Day 1	Equal variances assumed	.108	.743	5.418	98	.000
	Equal variances not assumed			5.418	97.797	.000
Day 2	Equal variances assumed	1.284	.260	2.290	98	.024
	Equal variances not assumed			2.290	97.056	.024
Day 3	Equal variances assumed	3.717	.057	-.825	98	.411
	Equal variances not assumed			-.825	94.220	.411
Day 4	Equal variances assumed	4.467	.037	-3.314	98	.001
	Equal variances not assumed			-3.314	91.549	.001
Day 5	Equal variances assumed	1.619	.207	-3.999	83	.000
	Equal variances not assumed			-3.921	71.060	.000
Day 6	Equal variances assumed	4.712	.034	-2.245	62	.028
	Equal variances not assumed			-1.654	21.809	.113
Day 7	Equal variances assumed	1.235	.272	-3.905	46	.000
	Equal variances not assumed			-4.066	33.537	.000
Day 8	Equal variances assumed	1.941	.172	-3.056	36	.004
	Equal variances not assumed			-3.460	29.402	.002
Day 9	Equal variances assumed	.152	.700	-1.529	25	.139
	Equal variances not assumed			-1.498	12.652	.159
Day 10	Equal variances assumed	4.396	.056	-2.229	13	.044
	Equal variances not assumed			-3.229	12.602	.007
Day 11	Equal variances assumed	3.178	.118	-2.767	7	.028
	Equal variances not assumed			-4.049	5.013	.010

The comparisons of platelet count of patients between kiwi group and guava group are significant for Day 1, Day 2, Day 4, Day 5, Day 7, Day 8, Day 10 and Day 11. There is significant difference in platelet count of patients between kiwi group and guava group on Day 1, Day 2, Day 4, Day 5, Day 7, Day 8, Day 10 & Day 11 on an average.

The comparisons of platelet count of patients between kiwi group and guava group are not significant for Day 3, Day 6, Day 9. There is no significant difference in platelet count of patients between Kiwi Group & Guava Group on Day 3, Day 6, Day 9 on an average.

**Means Plot:**



**Figure 4:** The comparison of day wise platelet counts between two groups kiwi and guava

The means plot shows that the platelet counts at day 1 and day 2 are significantly lower for guava group than that for kiwi group on an average. Then from day 3 onwards the platelets are significantly higher for guava group than that for kiwi group on an average. There is only increasing tendency of platelet count in guava group, while in kiwi group we can see first decreasing and then increasing tendency of platelet count.

**3.19. Comparison of Increase in Platelet count between Kiwi & Guava Groups:**

**Table 18:** The comparison of day wise increase in platelet counts between two groups Kiwi and Guava is done by t test for two independent samples. The results are as follows.

**Calculation Tables:**

Group Statistics					
Groups		N	Mean	Std. Deviation	Std. Error Mean
Day 2	Kiwi	50	-19080.00	21667.09	3064.19
	Guava	50	8220.00	9074.05	1283.26
Day 3	Kiwi	50	-29480.00	32594.13	4609.51
	Guava	50	21480.00	20317.12	2873.27
Day 4	Kiwi	50	-31040.00	40842.14	5775.95
	Guava	50	41240.00	30533.73	4318.12
Day 5	Kiwi	48	-33875.00	47014.99	6786.03
	Guava	37	57972.97	39850.06	6551.31

Group Statistics					
Groups		N	Mean	Std. Deviation	Std. Error Mean
Day 6	Kiwi	42	-26500.00	57916.36	8936.69
	Guava	22	117954.55	236457.28	50412.86
Day 7	Kiwi	32	-28593.75	48607.62	8592.69
	Guava	16	76125.00	49071.21	12267.80
Day 8	Kiwi	26	-13423.08	49007.90	9611.24
	Guava	12	89250.00	56964.30	16444.18
Day 9	Kiwi	19	736.84	56310.49	12918.51
	Guava	8	77825.00	59474.02	21027.24
Day 10	Kiwi	11	6636.36	49966.53	15065.48
	Guava	4	122000.00	32155.87	16077.94
Day 11	Kiwi	6	32000.00	54424.26	22218.61
	Guava	3	141333.33	17616.28	10170.76
Day 12	Kiwi	3	41333.33	44635.56	25770.35
	Guava	0 <sup>a</sup>			
Day 13	Kiwi	1	23000.00		
	Guava	0 <sup>a</sup>			

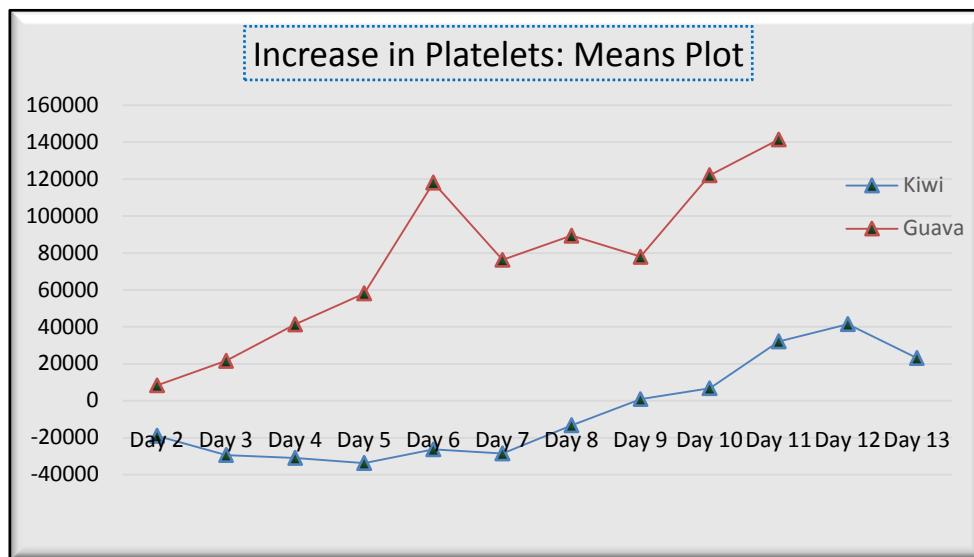
a. t cannot be computed because at least one of the groups is empty.

Independent Samples Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	P value (2-tailed)
Day 2	Equal variances assumed	14.027	.000	-8.218	98	.000
	Equal variances not assumed			-8.218	65.675	.000
Day 3	Equal variances assumed	6.600	.012	-9.382	98	.000
	Equal variances not assumed			-9.382	82.083	.000
Day 4	Equal variances assumed	2.593	.111	-10.023	98	.000
	Equal variances not assumed			-10.023	90.736	.000
Day 5	Equal variances assumed	1.622	.206	-9.531	83	.000
	Equal variances not assumed			-9.738	82.207	.000
Day 6	Equal variances assumed	3.055	.085	-3.774	62	.000
	Equal variances not assumed			-2.821	22.329	.010
Day 7	Equal variances assumed	.913	.344	-7.014	46	.000
	Equal variances not assumed			-6.992	29.852	.000
Day 8	Equal variances assumed	.018	.893	-5.705	36	.000
	Equal variances not assumed			-5.391	18.832	.000
Day 9	Equal variances assumed	.178	.677	-3.197	25	.004

	Equal variances not assumed			-3.124	12.584	.008
Day 10	Equal variances assumed	.915	.356	-4.252	13	.001
	Equal variances not assumed			-5.236	8.593	.001
Day 11	Equal variances assumed	1.098	.330	-3.293	7	.013
	Equal variances not assumed			-4.474	6.591	.003

The comparisons of increase in platelet counts of patients between kiwi group and guava group are significant for all days from 1 to 11. There is significant difference in increase in platelet count of patients between kiwi group and guava group on all days from 1 to 11 on an average.

**Means Plot:**



**Figure 5:** The comparison of day wise increase in platelet counts between two groups Kiwi and Guava

The means plot shows that the increase in platelet counts is significantly higher for guava group than that for kiwi group for all days on an average.

**3.20. Comparison of Number of days for recovery between Kiwi and Guava Groups:**

**Table 19:**The comparison of number of days for recovery between two groups Kiwi and Guava is done by t test for two independent samples. The results are as follows.

**Calculation Tables:**

Group Statistics					
Groups		N	Mean	Std. Deviation	Std. Error Mean
No. of Days for Recovery	Kiwi	50	7.76	2.22	0.31
	Guava	50	6.04	2.09	0.30

Independent Samples Test						
		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	P value (2-tailed)
No. of Days for Recovery	Equal variances assumed	.420	.518	3.991	98	.000
	Equal variances not assumed			3.991	97.651	.000

The comparison of number of days required for recovery of patients between Kiwi Group & Guava Group is significant. There is significant difference in number of days required for recovery of patients between Kiwi Group & Guava Group. On an average the number of days required for recovery of patients is significantly less in Guava Group than that in Kiwi Group.

Thus we have been done a comparative statistical analysis to check whether there was any significant difference in platelet counts in between kiwi and guava group. The test used was 't' test for two independent samples. Level of significance is less than 0.05 ( $p < 0.05$ ).

Above statistics shows that there was only increasing tendency of platelet count in guava group while in kiwi group there was first decreasing tendency and then increase in platelet count, Also early recovery was significant in guava group compared to kiwi group at significance level 0.05 ( $p < 0.05$ ). Thus the study suggested that majority patients in guava group recovered within first 5-7 days while majority patients in kiwi group recovered in 9-10 days.

Above findings from this study suggest that there was a significant effect of guava on platelet count and number of days required for recovery compared to kiwi group. In this study not a single patient from both groups reported any adverse reaction due to kiwi or guava.

## CONCLUSION:

This study may concluded that in thrombocytopenia patients which is induced by dengue fever or any other viral fever guava fruit is better than kiwi fruit to increase in platelet count and for early recovery too.

## Limitations

Antenatal care females were not included in this study.

## Acknowledgement

Thanks to Dr Tabrej Pathan, Namrata Surve, Komal Dubal research team and all staff in Vishwaraj Hospital, Loni kalbhor, Pune and Shrigiri Hospital, Hadapsar, Pune, Maharashtra, India

## Abbreviation

Units used in this study

1. gms - grams
2. kcal- kilocalories
3. mg – milligram
4. µg – microgram

## Conflict of Interest

Author declares no conflicts of interest.

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