## RESEARCH ARTICLE

## COMPARATIVE STUDY OF ACCURACY OF BIOMETRIC FORMULAS OBTAINED BY APPLANATION A-SCAN BIOMETRY.

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### *Manuscript Info*

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### *Abstract*

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**Aim of the study:** To evaluate and compare the accuracy of different intra ocular lens (IOL) power calculation formulas for predicting post operative refraction in eyes of different axial lengths using applanation A scan biometry

**Methods:** In prospective study, conducted in GREH, Visakhapatnam with 50 eyes.Axial lengths were calculated by applanation A-scan biometry. All eyes were divided into three groups according to AL: short (<22.0 mm), average (22.0–25.0 mm), and long (>25.0 mm) eyes. IOL power calculation was done using the five Formulas SRKII, SRK/T, HOLLADAY 1, HOFFERQ, and BINKHORST 2. All patients were subjected to SICS with PCIOL implantation under local anaesthetia.The implanted power of IOL was based on SRK II formula. Final refraction was measured 6 weeks postoperatively.Post-operative spherical equivalent (SE) was calculated and compared with predicted refractive error using each biometric formula.

**Results:** All formulas had a significantly lower MAE in comparison with BINKHORST II formula. SRK II and SRK/T had lowest MAE (**0.58±0.44**) for all eyes. SRK II had the lowest MAE for average (**0.54±0.40**) and short (**0.67±0.54**)eyes.SRK/T had the lowest MAE (**0.63±0.48**) for long eyes. BINKHORST II formula had highest MAE for all (**0.69±0.48**) and average (**0.68±0.46**) eyes. HOFFER Q formula had highest MAE (**0.76±0.65**) for short eyes and SRK II had highest MAE (**0.89±0.64**) for long eyes

**Conclusion:**SRK II and SRK/T  are accurate  formulas for average eyes.SRK II and HOLLADAY I are best formula of choice in short eyes.SRK/Tis  accurate  IOL  formula  for  long  eyes  followed  by HOLLADAY I and HOFFER Q .

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## Introduction:-
1.   With the introduction of new surgical techniques, cataract surgery not only focuses on visual rehabilitation but it is now considered as a form of refractive surgery
2.   Therefore accurate pre-operative intra ocular lens (IOL) power calculation is essential to achieve desired refractive outcomes

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**Aim:**
To evaluate and compare the accuracy of different intra ocular lens (IOL) power calculation formulas for predicting post-operative refraction in eyes of different axial lengths using Applanation A scan biometry

## Materials and methods:-

1. Aprospective study conducted from May 2017 to July 2017 in department of ophthalmology , GREH ,AMC , Visakhapatnam in 100 eyes
2. Axial length (al) of eye is measured by ApplanationAscan and corneal power by Keratometer.
3. All eyes were divided into three groups according to AL: short (<22.0 mm), average (22.0–25.0 mm), and long (>25.0 mm) eyes
4. IOL power calculation was done using the five formulas SRKII, SRK/T, HOLLADAY1, HOFFERQ, and BINKHORST 2.
5. All patients were subjected to SICS with PCIOL implantation under local anaesthesia
6. The implanted power of IOL was based on SRK II formula
7. Final refraction was measured 6 weeks postoperatively
8. The post-operative spherical equivalent (se) was calculated and compared with predicted refractive error using each biometric formula.

**Inclusion criteria:**
All patients above 18 years of age admitted for cataract surgery

**Exclusion criteria:**
1. Combined procedures
2. > 2D of postoperative astigmatism
3. PC rupture
4. Past ocular surgeries

**Figure 1:**-Gender distribution:
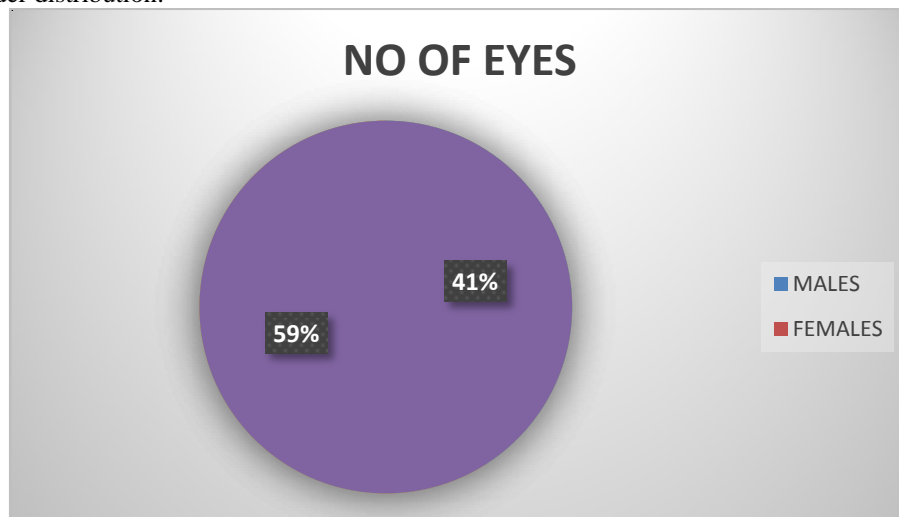


**Age distribution**:
Mean age was 62±3.2yrs in the study.

**Table1:-B**ased on AL, eyes were divided into 3 groups:

|  | AL | No of eyes | Percentage |
|---|---|---|---|
| Average eyes | 22-25mm | 87 | 87% |
| Short eyes | <22mm | 9 | 9% |
| Long eyes | >25mm | 4 | 4% |

**Table 2:-**Percentage of Refractive Errors (D) In Preoperative Power Prediction of Each Formula: 0-0.5 D

|              | All eyes(100) | Average eyes(87) | Short eyes(9) | Long eyes(4) |
|--------------|---------------|------------------|---------------|--------------|
| SRK II       | **60(60%)**   | **54(62%)**      | **5(55.5%)**  | 1(25%)       |
| SRK/T        | 56(56%)       | 50(58%)          | 4(44.4%)      | **2(50%)**   |
| HOLLADAY I   | 54(54%)       | 48(56%)          | 4(44.4%)      | **2(50%)**   |
| HOFFER Q     | 51(51%)       | 45(52%)          | 4(44.4%)      | **2(50%)**   |
| BINKHORST II | 48(48%)       | 42(48%)          | **5(55.5%)**  | 1(25%)       |

**Table 3:-**Percentage of Refractive Errors (D) In Preoperative Power Prediction of Each Formula: 0.5-1.0 D

|              | ALL EYES(100) | AVERAGE EYES(87) | SHORT EYES(9) | LONG EYES(4) |
|--------------|---------------|------------------|---------------|--------------|
| SRK II       | 86(86%)       | 77(88.5%)        | 7(77.7%)      | 2(50%)       |
| SRK T        | 86(86%)       | 77(88.5%)        | 6(66.6%)      | 3(75%)       |
| HOLLADAY I   | 87(87%)       | 76(66.1%)        | 7(77.7%)      | 4(100%)      |
| HOFFER Q     | 88(88%)       | 77(88.5%)        | 7(77.7%)      | 4(100%)      |
| BINKHORST II | 82(82%)       | 73(63.5%)        | 5(55.5%)      | 4(100%)      |

**Table 4:-M**ean absolute error (MAE) indiopters of each formula:

|            | ALL EYES(100) | AVERAGE EYES(87) | SHORT EYES(9) | LONG EYES(4) |
|------------|---------------|------------------|---------------|--------------|
| **SRK II** | **0.58±0.44** | **0.54±0.40**    | **0.67±0.54** | **0.89±0.64** |
| **SRK T**  | **0.58±0.44** | **0.56±0.43**    | **0.70±0.63** | **0.63±0.48** |

| HOLLADAY I | 0.66±0.48 | 0.66±0.48 | 0.68±0.48 | 0.66±0.48 |
|---|---|---|---|---|
| HOFFER Q | 0.67±0.46 | 0.55±0.44 | 0.76±0.65 | 0.66±0.52 |
| BINKHORST II | 0.69±0.48 | 0.68±0.46 | 0.75±0.72 | 0.78±0.51 |

## Results:
1. All formulas had a significantly lower MAE in comparison with BINKHORST II formula
2. SRK II and SRK/T had the lowest MAE (**0.58±0.44**) for all eyes.
3. SRK II had the lowest MAE for average (**0.54±0.40**) and short (**0.67±0.54**) eyes.
4. SRK/T had the lowest MAE (**0.63±0.48**) for long eyes. The BINKHORST II formula had the highest MAE for all (**0.69±0.48 d**) and average (**0.68±0.46d**) eyes.
5. The HOFFER Q formula had the highest MAE (**0.76±0.65d**) for short eyes and SRK II had the highest MAE (**0.89±0.64d**) for long eyes.

## Discussion:
1. Hoffer et al study published a series of 450 cases, concluded SRK/T, HOLLADAY I and HOFFER Q were statistically similar and all were better than SRK II with al >26 mm i.e in long eyes which is similar to our study.
2. Ozcura et al study conducted in turkey found that SRK II and SRK/T has least MAE in average and short eyes, SRK/T has least MAE in long eyes which is similar to our study.
3. Mithra et al study conducted in a subset of Indian myopes giving HOLLADAY I formula is accurate in myopesi.e in long eyes,where as in our studySRK/T is accurate in long eyes followed by HOLLADAY I and HOFFER Q .

## Conclusion:-
1. SRK IIand SRK/T are accurate formulas for average eyes.
2. SRK IIand HOLLADAY I are best formula of choice in short eyes.
3. SRK/Tis the accurate IOL formula for long eyes followed by HOLLADAY I and HOFFER Q
4. Though IOL master is advanced technology in calculating IOL power,but it has disadvantage in medial opacities.thereforeApplanation A scan biometry is still considered in medial opacity and in rural areas where advanced instruments not available.

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